



This contains the entire document Charting the Course from the Comprehensive Conservation and Management Plan for Tampa Bay.

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File 1 of 1

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TAMPA BAY NATIONAL ESTUARY PROGRAM

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Charting the Course for Tampa Bay

December 1996

Charting the Course is the Comprehensive Conservation & Management Plan for Tampa Bay. A draft of this document was released in January 1996 for public discussion and review, and recommendations from reviewers were considered for incorporation into the plan. *Charting the Course* was produced by the Tampa Bay National Estuary Program, in cooperation with local government and agency partners. We welcome your comments and inquiries.

PREFACE

Charting the Course caps five years of scientific research and community outreach by the Tampa Bay National Estuary Program (NEP), which was established in 1991 to assist the region in developing a comprehensive plan for bay restoration and protection. The Program is a partnership of Hillsborough, Pinellas and Manatee counties; the cities of Tampa, St. Petersburg and Clearwater; the Southwest Florida Water Management District; Florida Department of Environmental Protection; and the U.S. Environmental Protection Agency.

Action Plans for bay improvement have been developed with assistance from bay experts, advocates, community interests and citizens. More than 250 residents attended a series of Town Meetings on Tampa Bay in the Spring of 1996 to discuss the draft plan with panels of experts from their communities. The NEP and its citizen advisors also conducted a series of smaller focus groups to solicit feedback from specific interest groups. A summary of public comments is available from the NEP.

This strategic blueprint reflects broad-based input from individuals, groups and communities that share a common interest in a healthy bay as a cornerstone of a healthy and prosperous region. Our thanks to these participants for their substantial insights and contributions.

The Tampa Bay National Estuary Program invites your comments and participation as we continue to assist the region in charting the course for the future of Tampa Bay.

ABOUT *CHARTING THE COURSE*

Charting the Course has been designed for easy access and review. A detailed table of contents and index of action plans and associated actions for bay improvement are located at the beginning of the document on pages V-VIII. Other important points of information are provided below to further assist you in your review and understanding of the Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay.

THE TAMPA BAY NEP



The Tampa Bay National Estuary Program is a partnership of the U.S. Environmental Protection Agency; Florida Department of Environmental Protection; Southwest Florida Water Management District; Hillsborough, Pinellas and Manatee counties; and the cities of Tampa, St. Petersburg and Clearwater. The Program was established in 1991 to assist the community in developing a comprehensive plan to restore and protect Tampa Bay.

STATE OF THE BAY



This chapter explores the state of the bay along with the management structure charged with the bay's protection. Because restoration is a complex task that demands effective ecosystem management, this chapter describes the rich mosaic of underwater and coastal habitats and diverse animal communities that comprise Tampa Bay. Important trends in these living resources, as well as the water and sediment quality upon which their health depends, are presented.

GOALS & PRIORITIES



Goals and priorities for Tampa Bay are summarized in a chapter immediately preceding bay action plans. These specific and attainable targets, outlined in text and a chart, are the foundation for strategies and themes advanced in *Charting the Course*. They relay overall priorities for bay restoration and protection, so that you can better evaluate the benefits of measures to protect this vital natural and economic resource.

ACTION PLANS FOR BAY IMPROVEMENT



Charting the Course presents a comprehensive slate of actions to assist community partners in selecting cost-effective and environmentally beneficial improvements in five key areas: Water & Sediment Quality, Bay Habitats, Fish & Wildlife, Dredging & Dredged Material Management and Spill Prevention & Response. A sixth action plan outlines strategies for continued Public Education and Involvement and describes some of the many opportunities available to bay area residents who wish to get involved.

Action plans for Tampa Bay identify a range of strategies that allow local communities to maximize return on their investment in bay recovery and protection. Many actions also achieve multiple environmental objectives, such as pollution prevention and water

conservation. Each action plan begins with an introduction that summarizes the topic, presents management objectives, and includes a list of actions to address those objectives.



As implementation of the bay plan begins, some important technical investigations continue. Studies are underway to more clearly identify the amount and sources of atmospheric deposition to the bay, and to evaluate the risks of toxic contaminants in various bay sectors. This work will help the community to finalize action plans addressing these important environmental concerns.



References in action plans to local governments under the headline "Responsible parties" refer to Hillsborough, Pinellas and Manatee counties and the cities of Tampa, St. Petersburg and Clearwater, unless otherwise noted, although all local communities in the region are urged to participate.

IMPLEMENTING THE PLAN AND MONITORING BAY IMPROVEMENT



The NEP partners will sign an agreement to implement the CCMP for Tampa Bay in the Spring of 1997, pledging to achieve the goals of the bay management plan and committing to specific actions and timetables. The Implementation & Financing chapter describes the agreement and the NEP's role in overseeing implementation, as well the costs associated with key elements of the plan such as nitrogen management.



The monitoring of Tampa Bay's health is central to the success of bay restoration efforts, enabling communities to measure return on investment and helping bay managers refocus their efforts when necessary. The bay monitoring program devised by the NEP in cooperation with local governments and agencies is presented in the Monitoring chapter.

GETTING A HEAD START



Some key strategies for bay improvement included in *Charting the Course* already are being implemented. For example, the NEP has provided a \$40,000 grant to upgrade an existing ship surveillance system to reduce the potential for spills of oils or hazardous materials in the bay. NEP also has pledged \$40,000 to assist the U.S. Army Corps of Engineers in developing a long-term, coordinated dredged material disposal plan for Tampa Bay. Additionally, several major habitat restoration projects are underway and other critical projects are planned, along with efforts to preserve environmentally sensitive coast lands.



Since its inception in 1991, the Tampa Bay NEP has assisted the community in securing more than \$1 million in federal and state grants for restoration of bay habitats and resources. Profiles of these head-start initiatives, which range from wetland restorations to support of bay scallop recovery, are presented in the chapter on Early Action.



The Tampa Bay NEP also has awarded more than \$50,000 in small grants to more than a dozen communities, schools, and organizations for various bay improvement projects. These community partnerships are profiled in the Public Involvement chapter.

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ing pairs of 25 species each year, including pelicans, egrets, herons, cormorants, terns, ibis and spoonbills. Many other birds such as the American white pelican and several species of sandpipers spend the winter here, logging thousands of miles on their annual pilgrimage to Tampa Bay.

TROUBLED WATERS

The bay's natural habitats are the nerve center of this dynamic system, but they have sustained heavy damage. Most impacts occurred in a span of about three decades beginning in the 1950s with unchecked development along the bay's shoreline. Studies by the Tampa Bay National Estuary Program (NEP) and other environmental agencies reveal the extent of habitat declines driven by massive dredge-and-fill projects to develop navigational channels, waterfront communities and industrial sites.

Dredging and pollution destroyed more than half of the bay's underwater meadows of seagrass and natural shoreline. Small creeks and streams were straightened to speed drainage of wetlands and expand access to the bay, altering natural freshwater flows and allowing fast-growing exotic plants to overtake native wildlife habitats.

As the bayscape was redrawn and water quality deteriorated, fisheries and wildlife declined. A once-thriving bay scallop fishery was virtually eliminated by the mid-1960s; although scientists don't know why, many suspect pollution was to blame. Harvests of clams and oysters also plummeted as bacterial contamination forced the closure of productive shellfishing grounds. Seagrass and wetland destruction hastened the decline of many other popular recreational and commercial species, including seatrout, red drum and snook.

Likewise, populations of nesting birds in Tampa Bay have declined in the last half-century. Particularly vulnerable are species such as the white ibis, which nests in coastal wetlands but requires inland freshwater food sources for survival. White ibis populations have dropped by as much as 75 percent in Tampa Bay. A similar pattern of decline triggered by destruction of freshwater wetlands has been documented in the Florida Everglades.

TURNING POINT

Since the 1970s, when the Clean Water Act was enacted, local communities and industries have made significant strides in improving water quality to restore the damaged estuary. Nitrogen was the chief target. Excess amounts of this naturally occurring and otherwise beneficial nutrient had fueled algal growth in the bay, clouding the water and cutting off light to underwater seagrasses.

The year 1979 marked a turning point in the bay's recovery when the City of Tampa modernized the Howard F. Curren Plant at Hookers Point, the region's largest wastewater treatment facility. The \$100-million project is credited with sharply reducing nitrogen from treated wastewater piped into the bay.

Across the bay, the City of St. Petersburg was pioneering new technology to re-use the nutrient-rich wastewater it pumped to the bay. Started in 1978, this reclaimed water project was one of the most ambitious in the nation and now provides treated

wastewater for irrigation to more than 8,500 homes and businesses. The City of Clearwater also has contributed to the bay's recovery, investing more than \$50 million in the mid-1980s to upgrade wastewater treatment plants to advanced treatment standards.

As discharges of pollutants were reduced, nature responded. Monitoring results show water quality improvements since 1984. Improved water clarity is believed to have triggered a return of seagrasses to areas that had been barren for decades. Between 1982 and 1992, more than 4,000 acres of new or expanded seagrass beds have been documented in the bay.

Aggressive fisheries management, coupled with improvements in water quality and habitats, have helped to reverse the decline of snook and red drum. Monitoring data now indicates that juvenile stocks of these prized gamefish are on the upswing.

This impressive turnaround owes much to environmental regulation and advances in sewage treatment that have helped to cleanse the bay of damaging pollutants. Community support and involvement also have been instrumental in charting the course for the bay's recovery. Building on St. Petersburg's initiative, many local communities are discovering the dual benefits of re-using treated wastewater to reduce demand on groundwater supplies, while helping to rid the bay of excess nutrients.

Despite this success, other forms of pollution continue to threaten the bay, with potential impacts far greater than bay managers previously thought. New studies have identified air pollution as a significant and persistent source of bay pollution. Recent studies also have revealed the presence of toxic contaminants in bay sediments in localized urban, industrial and agricultural areas. The NEP is conducting risk assessments to identify the contaminants of greatest concern.

DEFINING THE CHALLENGE

Population in the tri-county region is expected to increase about 17 percent to 2.34 million by the year 2010. The challenge to bay stewards will be to maintain water quality gains and continue the bay's recovery while accommodating future growth. The success of local communities over the last 15 years in enhancing water quality while experiencing rapid growth is a promising indication that this can be achieved.

The signs of environmental distress that prompted the bay cleanup were more visible 20 years ago. However, limited resources and competing social needs now require that bay restoration be accomplished with a smaller share of funding. Environmental managers in government and industry will be challenged to define objectives more clearly and implement the most cost-effective strategies to assist bay recovery.

These efforts should be based upon a clear vision, bolstered by broad community support, of what Tampa Bay should look like, what uses it should support, and how it should be managed. With a well-defined, fiscally sound and united effort, Tampa Bay in the year 2010 can be a place where:

- surrounding communities will be recycling wastewater, reducing both the demand on limited drinking water supplies and the amount of excess nitrogen and other

- pollutants discharged to the bay;
- neighborhoods and businesses will have adopted environmentally friendly landscaping practices, using native and drought-tolerant plants that require less water, fertilizer and pesticides;
- seagrasses will have responded to increased water clarity and recolonized thousands of acres of bay bottom, providing vital fish habitat;
- hundreds of additional acres of productive coastal marshes and mangroves will be in public ownership or otherwise safeguarded, extending permanent protection to these wetland habitats so crucial to birds and other animals;
- toxic contamination of sediments at “hot spots” around the bay will be reduced to levels harmless to fish and shellfish through pollution prevention and treatment;
- citizens will have a heightened awareness and understanding of the issues facing Tampa Bay and how they can help the bay;
- farmers will be utilizing low-volume irrigation methods that conserve water and reduce nutrient and pesticide runoff;
- local governments and the Southwest Florida Water Management District will have established minimum flows for rivers impounded by dams to ensure an adequate supply of fresh water to the bay;
- bay improvements, combined with effective wildlife and fisheries management, will have brought about healthy populations of manatees, sea turtles and dolphins, and increased catches of trout, red drum, snook and other game fish;
- harbor pilots will guide oil tankers along the bay’s shipping channels using a state-of-the-art vessel tracking system that will greatly reduce the risk of ship collisions and catastrophic spills;
- bay area port authorities and the U.S. Army Corps of Engineers will have expanded beneficial uses of dredged material and developed long-term disposal options through a coordinated management plan;
- goals and actions in *Charting the Course* will have been incorporated into permits and programs, providing a clear and common agenda for bay improvement.

This vision of the bay and its management is attainable. Indeed, some goals have been nearly met already; others are achievable within the next five years thanks to measures being taken today by government, citizens and industry. Meeting the remainder of the challenges defined in this plan, and maintaining the hard-won gains that already have occurred, will require the community’s long-term commitment.

CHARTING THE COURSE

Today’s challenges call for a new direction in bay management, one that involves all stakeholders in developing achievable goals for bay improvement and secures commitments for action. At the heart of this effort is the overall goal of ecosystem management, an evolving process that considers the bay and its myriad tributaries as one large and interdependent ecosystem.

Strategies to repair and protect the Tampa Bay ecosystem, in the most cost-effective manner and adhering to the principles of ecosystem management, are the foundation for *Charting the Course*.

Action Plans presented in *Charting the Course* support and advance bay recovery. These plans identify necessary steps, associated costs, implementation schedules and recommendations on ways to use existing resources most effectively.

Charting the Course begins by exploring the state of the bay and the management structure charged with bay protection. Bay restoration has begun, but much work remains. Recovery will require time, innovative public-private partnerships and clear strategies that focus on pollution prevention, conservation of natural resources and incentive-based alternatives to regulation. *Charting the Course* presents a vision for Tampa Bay and a chance for all citizens to participate in its restoration.

Volume II of *Charting the Course*, which will be published in 1997, will detail the technical investigations and modeling tools used by the Tampa Bay NEP to characterize bay conditions and support bay improvement strategies.

About the Tampa Bay National Estuary Program

The Tampa Bay National Estuary Program was established in 1991 to assist the community in developing a comprehensive plan to restore and protect Tampa Bay. The program is part of a national network of 28 estuary programs established under the Clean Water Act and administered nationally by the U.S. Environmental Protection Agency (EPA). Local administrative support is provided through the Tampa Bay Regional Planning Council.

The landmark agreement establishing the Tampa Bay NEP brought together Hillsborough, Pinellas and Manatee counties; the cities of Tampa, St. Petersburg and Clearwater; the Southwest Florida Water Management District; Florida Department of Environmental Protection; and EPA in a partnership committed to action. These partners will sign an implementing agreement in the Spring of 1997, pledging to achieve the goals of the Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay.

Since 1991, the Tampa Bay NEP has conducted extensive technical investigations to define bay conditions, impacts and environmental needs. Steps in developing the CCMP are outlined in Figures 1 and 2, beginning with efforts to define the bay's priority problems. A key focus of the NEP has been to coordinate existing bay management programs to maximize benefits to the bay and the people who share this magnificent resource.

Early technical findings and actions were reported to the community in *Status & Trends*, published by the Tampa Bay NEP in 1993. Additionally, the NEP has developed a number of educational outreach programs and provided grants to involve citizens and communities in efforts to improve their bay. These efforts, and a summary of the community's response to the draft CCMP, are presented in the chapter on public involvement.

Figure 1

Defining The Bay's Priority Problems

Scientists and citizens from the Tampa Bay region participated in a series of meetings in late 1990 and early 1991 to identify and rank the bay's priority problems. Advisors completed data sheets identifying their concerns and were asked to evaluate for each: the extent of the problem; associated risks to the estuary; available knowledge and data needs; and current management efforts.

Summarized below, the initial list of seven priority problems was formally adopted by the NEP's Policy Committee in 1991 and became the springboard for studies to investigate bay conditions and for a multi-faceted public education and outreach campaign.

Atmospheric deposition was not originally believed to be a significant issue. Scientists now estimate that about one-third of the total nitrogen entering the bay comes from the air. Important research is underway to more closely identify the magnitude and sources of this pollution.

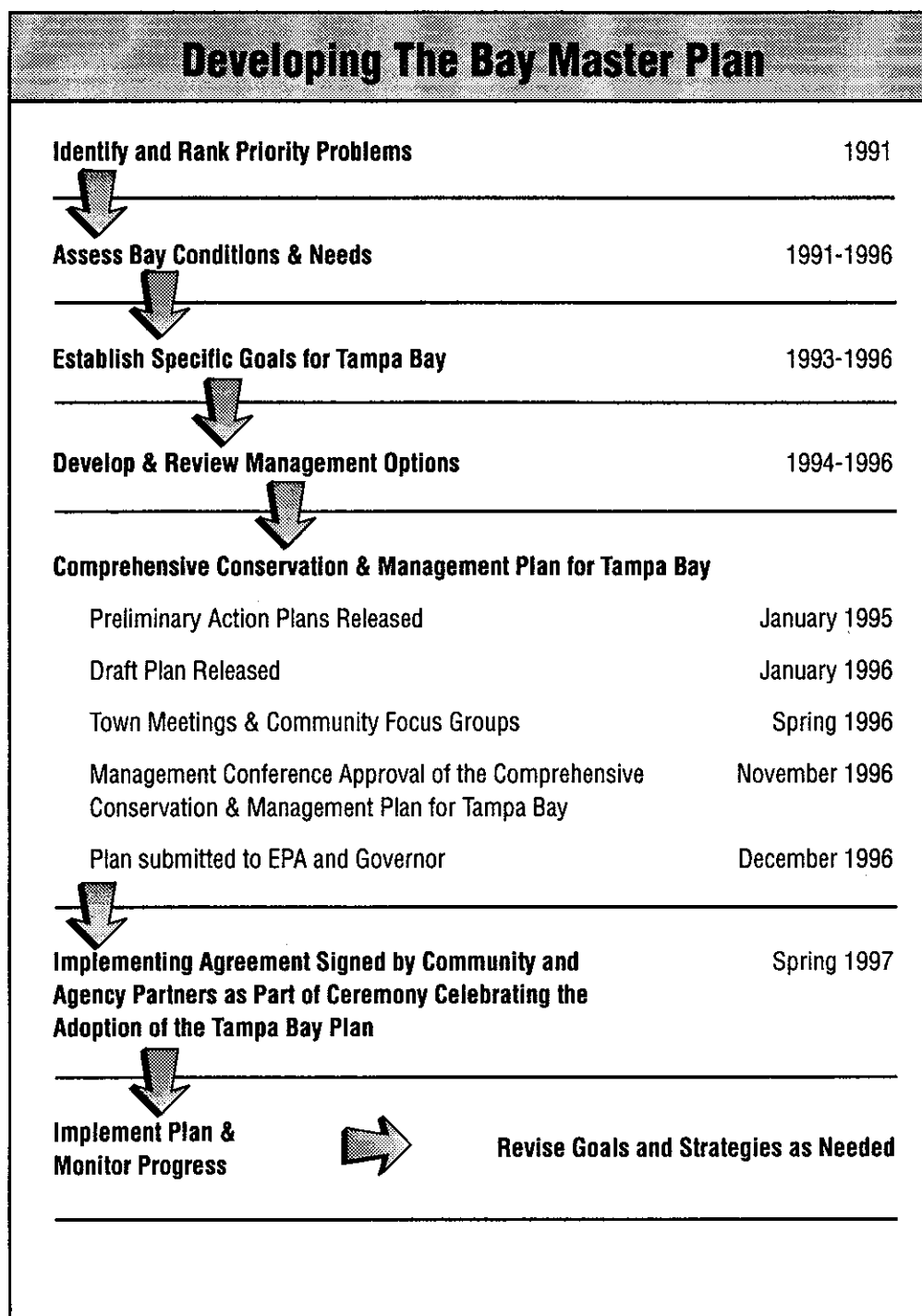
List of Priority Problems for Tampa Bay

Adopted January 11, 1991

- Water quality declines/eutrophication, resulting from excess nitrogen in stormwater runoff, direct discharges to the bay and from atmospheric deposition
- Declines and impacts to living resources and habitats
- Increased user conflicts and impacts associated with recreational, commercial and shipping activity
- Lack of agency coordination and response
- Lack of community awareness, noting the specific need for improved boater education, general public outreach and efforts to make the bay more accessible to residents
- Circulation and flushing
- Hazardous/toxic contamination, including sediment contamination and oil/hazardous materials spills

Source: Management Conference Agreement, Tampa Bay NEP, March 1991

Figure 2



CHARTING *the* COURSE

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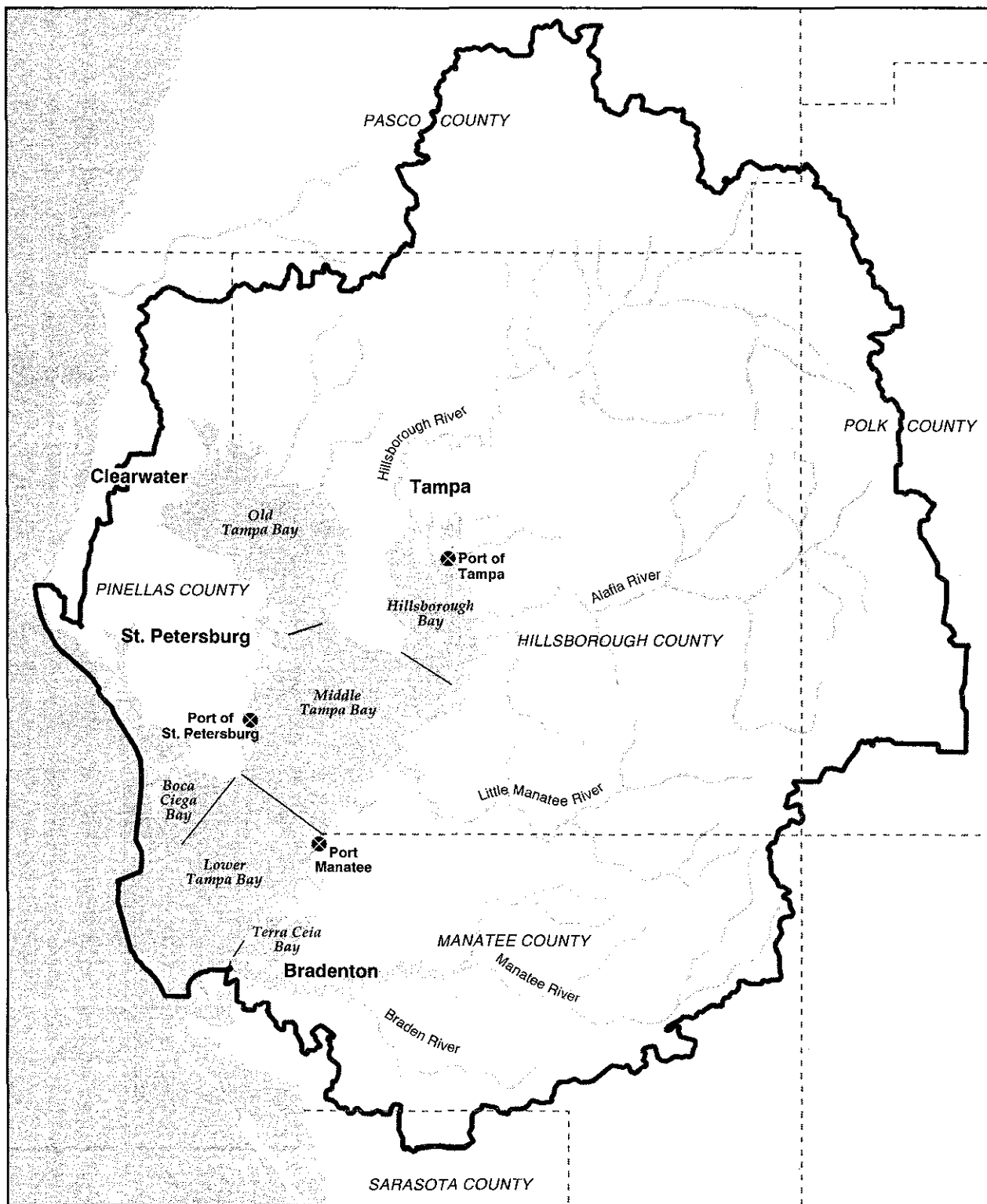
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Tampa Bay Watershed Boundaries and Bay Segments

Figure 3



More than 2 million people reside in the 2,200-square-mile Tampa Bay watershed, which reaches into Sarasota, Pasco and Polk counties and includes three major seaports. Tampa Bay is Florida's largest open-water estuary, covering almost 400 square miles.

State of the Bay

From the headwaters of the Hillsborough River to the salty waters off Anna Maria Island, Tampa Bay encompasses a rich mosaic of underwater and coastal habitats that support thousands of species of plants and animals. Preserving and restoring these interdependent habitats — even in the face of continued growth — is critical to the bay’s future.

Estuaries like Tampa Bay, where salt water from the sea and fresh water from rivers mix, are among the world’s most productive ecosystems. More than 70 percent of all commercially important species of fish depend on estuaries at some stage in their development.¹ The bay also attracts a remarkable number and variety of birds and animals that depend on its rich tapestry of habitats and diverse food supply.

As Florida’s largest open-water estuary, Tampa Bay spans almost 400 square miles and receives drainage from a 2,200-square-mile watershed more than five times the bay’s size.² Activity in this watershed has a profound influence on the health of the bay. Nutrients in runoff from the watershed fuel the bay’s productivity, but excess amounts of nutrients, as well as contaminants from neighborhoods, industries, cities and farms, pollute the bay.

Achieving a healthy balance of nutrients from the land and sea, and redressing past damage to habitats and protecting them in the future, remain vital to the bay’s health. These tasks become challenging in the context of modern growth. As population in the tri-county area surpasses 2 million people, actions we take at home, at work and in our communities increasingly influence the state of the bay.

This chapter explores the state of the bay — as well as the management structure charged with the bay’s protection — so that the community can direct future efforts where help is most needed and ensure that increasingly limited public funds are spent in a manner that best benefits the bay and the people who live around it. Restoration is a complex but achievable task that will require a steady focus on ecosystem management. Decisions based on ecosystem needs — those that recognize how individual habitats affect the health of the whole and how fish and wildlife depend upon this network for survival — can prevent costly and less effective piecemeal treatment.

Achieving the goals set out by the Tampa Bay National Estuary Program (NEP) will require a flexible, yet comprehensive, ecosystem management approach that takes into account the overall needs of the estuary. By considering and capitalizing on these differences, ecosystem management goes beyond traditional program boundaries — just as the bay ecosystem itself extends far beyond its visible borders. Thus, a plan based

on these principles can integrate actions and policies to better protect the bay's multifaceted resources.

By focusing less on government-imposed regulations and more on the actual requirements of the bay's living resources, opportunities for producing direct, measurable results that are cost-effective and community-specific can be identified. In this approach, success is measured less by compliance with laboratory standards for water quality than by increases in seagrasses, fish stocks and other biological indicators of a healthy estuary.

The NEP is committed to a course of action that emphasizes ecosystem management as a common-sense approach for protecting Tampa Bay well into the next century.

WATER AND SEDIMENT QUALITY

Since the 1980s, local communities have made significant strides in improving water quality in Tampa Bay. The quality of the bay's water and sediments is important to the animals and plants that reside in them, and also affects human use and enjoyment of the bay.

Excess amounts of nutrients and chemicals — some naturally occurring, others generated by humans — can jeopardize the bay's health. The most striking example of this occurred from the 1960s to the late 1970s, when excess nitrogen from discharges of partially treated sewage led to excess algae growth and low dissolved oxygen and light levels in the bay — a condition known as eutrophication. Degraded water quality contributed to seagrass losses by blocking light to the bay's underwater grass beds.

Sediment quality also has been impacted by potentially toxic contaminants carried in stormwater runoff, wastewater and atmospheric deposition to the bay. Studies conducted by the National Oceanic & Atmospheric Administration (NOAA) and the Florida Department of Environmental Protection (FDEP) in the last decade have revealed high levels of these contaminants in sediments at several bay sites, including upper Hillsborough Bay, Boca Ciega Bay and Bayboro Harbor.³

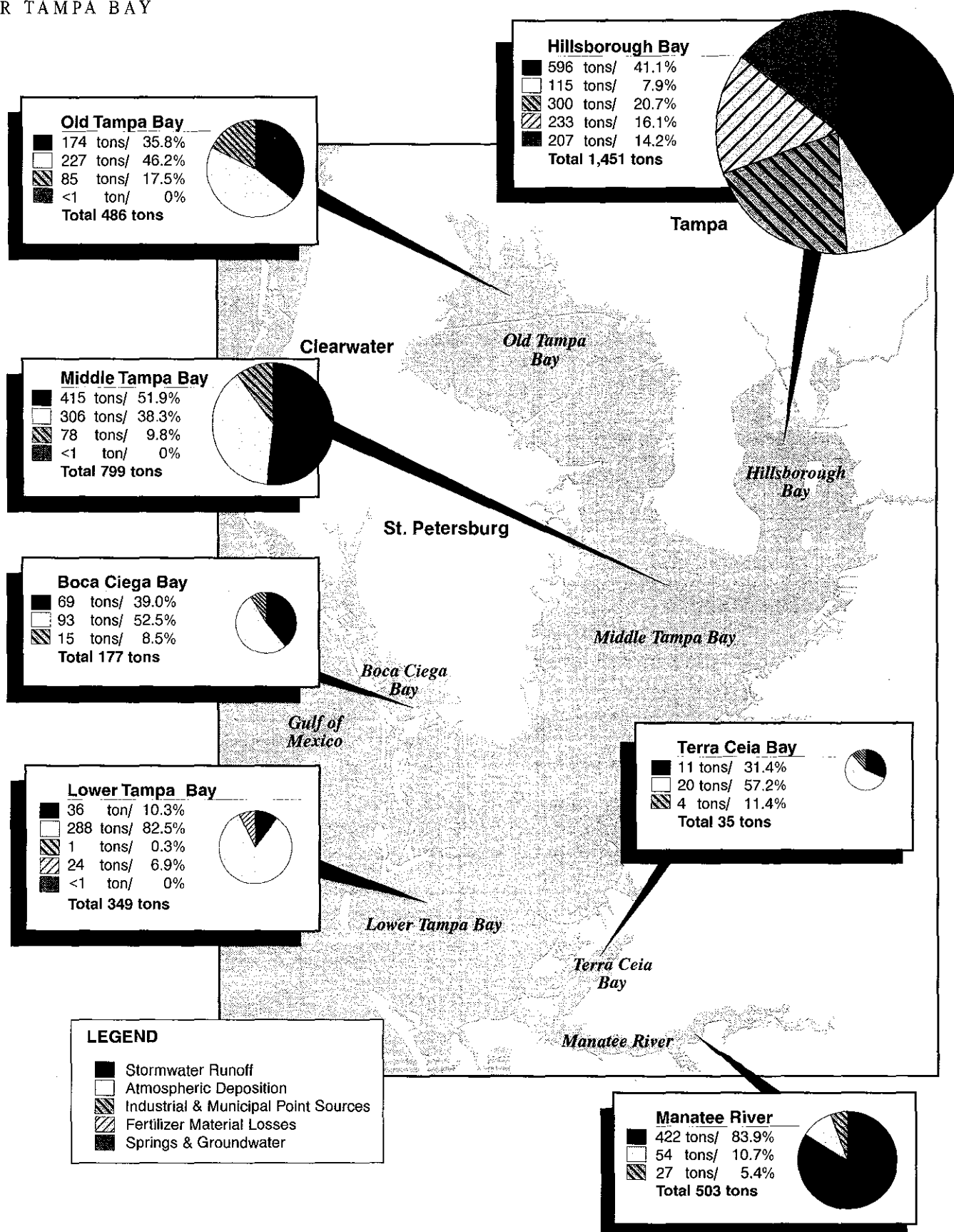
New studies show that atmospheric deposition of pollutants may play a much larger role in the bay's water quality than previously realized. Nitrogen and potentially toxic pollutants, primarily from industrial and vehicle emissions, fall to the surface of the bay and its tributaries or on the land where they are carried to the bay in stormwater runoff. Research financed by the Tampa Bay NEP indicates that almost one-third of the bay's total nitrogen load may come from atmospheric deposition directly to the surface of the bay.⁴

Recent attention also has focused on the problem of sanitary sewer overflows caused by heavy rainstorms that force some municipal treatment plants to shunt raw or partially treated sewage to Tampa Bay. Sewage overflows are of particular concern in St. Petersburg, where low land elevations and rapid population growth have combined to strain existing municipal sewer and stormwater systems. In August 1995, St. Petersburg was forced to shunt more than 15 million gallons of raw sewage into canals leading to the bay when torrential rains caused sewer backups.⁵ Corrective actions will be costly and will take time, but they are necessary to minimize associated water quality impacts and allay public concerns about the bay's safety as a recreational and fisheries resource.

Since 1974, the Environmental Protection Commission (EPC) of Hillsborough County has conducted a comprehensive water quality monitoring program in the bay's four major segments. The wealth of data compiled by EPC is the principal source of information for the following status and trends on bay water quality. A benthic monitoring program recently established by the counties surrounding the bay will track trends in sediment quality and the abundance and distribution of bottom-dwelling animals.

**Existing Annual Nitrogen Loadings to Tampa Bay
by Bay Segment (1992 - 1994 average)**

Figure 5



Estimates of existing and future nitrogen loadings to Tampa Bay are presented in Figures 4 and 5. Workshops with local governments and industry are being conducted to determine equitable allocations of the bay's nitrogen management goals to the jurisdictions and sources from which they originate. These commitments will form the basis of an agreement signed by community and agency partners in 1997 to implement the Tampa Bay restoration plan.

Toxic Contaminants

Toxic contaminants represent another primary focus of concern for bay managers. Overall, Tampa Bay has relatively low to moderate levels of most toxic parameters when compared to other urban estuaries.

Toxics of concern, identified in Figure 7, include various trace metals, pesticides, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).¹⁵ These substances, some naturally occurring and others synthetic, can be damaging or deadly to marine life when present in sufficiently high concentration. In addition, they have the potential to affect human health.

Recent studies by NOAA, the FDEP and the Tampa Bay NEP provide the most complete assessment to date of toxic substances of concern and their distribution in Tampa Bay.¹⁶ Contamination appears to be centered around large urban centers, ports and marinas, and concentrations generally diminish from the top of the bay toward the Gulf.

Results of a recent risk assessment conducted for the Tampa Bay NEP indicate that some contaminants are present at concentrations high enough to be harmful to fish and wildlife, either through direct exposure to bay sediments or indirectly through the food web. The first phase of the study, completed in 1996, assessed the risk to human health and marine life from contaminants in Hillsborough Bay and Boca Ciega Bay, two of Tampa Bay's most impacted sectors.¹⁷

The primary contaminants of concern identified in the study include metals, PAHs, PCBs, and chlorinated pesticides. Most of these pollutants enter the bay in stormwater runoff or through atmospheric deposition.

The second phase of the NEP risk assessment will focus on Bayboro Harbor and the western edge of Old Tampa Bay near Allen's Creek. These investigations will help identify which pollutants pose a continuing threat to the bay and those that represent past or inactive sources of pollution. Findings from the studies will be used to develop a more specific action plan addressing toxic contamination in 1997.

Although levels of most contaminants documented locally pose no known risk to humans, effects of repeated exposure to small amounts of these materials remain largely unknown. Some contaminated sediments remain inert or inactive for many years, then are disturbed by dredging, shipping, storms or animal activity. Bottom-dwellers that filter contaminated sediments — and the fish, birds and humans that ultimately consume them — can be placed at risk, since some toxic substances increase in concentration as they ascend the food web.

Toxics of Concern for Tampa Bay

	Contaminant/Impacts	Sources
Heavy Metals	Cadmium - Potentially toxic and may concentrate in food webs as it is retained for long periods in biological systems. Does not appear to accumulate in fish or undergo biomagnification, but does accumulate in sediments. High levels of cadmium present in sediments from the Hillsborough Bay/Lower Palm River, Allen's Creek, Cross Bayou and Boca Ciega Bay.	Common trace element widely employed in electroplating applications. Also present in paints, plastics, batteries and domestic sewage sludge.
	Chromium - Exhibits varied levels of toxicity in different fish species. Also listed as a mammalian carcinogen. Highest levels in bay sediments found in Hillsborough Bay near the mouth of the Alafia River, in Boca Ciega Bay near Cross Bayou, and near Bayboro Harbor.	Atmospheric sources include alloy and metal production, coal combustion, waste incineration, cement production. Direct sources include electroplating/metal finishing, wastewater treatment plants, iron/steel foundries and other industrial applications, residential runoff and phosphate fertilizers.
	Copper - Widely distributed in the natural environment, but also demonstrates acute toxicological effects at small concentrations above essential levels. Exceedingly toxic to aquatic biota. Highest levels in bay sediments found in Boca Ciega Bay near Cross Bayou, in Hillsborough Bay near the Alafia River and Davis Islands, and in Middle Tampa Bay near Bayboro Harbor and Papys Bayou.	Large number of human-induced sources to marine environment, including oil and fuel combustion, antifouling paints, metal-cleaning operations, plating baths and rinses, commercial pigments and dyes, wood preservatives, leachate from copper pipes, domestic sewage sludge, and copper sulfate used to control algae in reservoirs.
	Lead - Causes a number of acute and chronic human health impacts, and accumulates in sediments. High levels found in bay sediments from Hillsborough Bay near the Alafia River, the lower Hillsborough River, and Boca Ciega Bay near Cross Bayou.	Largest source of lead to the environment originates from its past use as a gasoline additive and from atmospheric deposition from auto emissions. Paint, batteries and domestic sewage sludge also are potential sources.
	Mercury - Naturally occurring in the environment, but also bioaccumulates in biota, causing acute toxicity at high concentrations. Sublethal effects include behavioral changes in invertebrates and birds, growth reduction in fish and algae, and impairment of senses and physical and mental development of children.	Atmospheric sources include municipal waste incinerators, fossil fuel combustion, paint additives (restricted by 1992), and re-emission from land sources. Used to produce batteries, electric switches and other electronic devices. Moves in sediments and water, and through bio-transportation.
	Zinc - Toxic at high concentrations and widespread in the environment. Highest levels in bay sediments found in Boca Ciega Bay near Cross Bayou and in Hillsborough Bay near the Alafia River.	Major application is coating of other metals to protect against corrosion. Used widely as a component in batteries and tires. Sources include municipal wastewater and sludge, direct industrial discharges, surface runoff, and atmospheric deposition.
Pesticides	DDT - Animal and potential human carcinogen; biomagnifies in organisms and persists in the environment. Caused widespread contamination of fish and wildlife, especially during 1960-80. Banned in 1972. DDT remains in sediments at several bay sites. Highest concentrations are reported at northern Boca Ciega Bay, northern Hillsborough Bay and near the Alafia River and Papys Bayou.	Formerly used to control a broad spectrum of agricultural, silvicultural and household insect pests.

Figure 7

	Contaminant/Impacts	Sources
Pesticides	<p>Chlordane - Environmentally persistent insecticide used extensively in termite control and also to control certain agricultural insects. Banned in 1988. Concentrations of chlordane at northern Boca Ciega Bay, Papys Bayou, Mullet Key and northern Hillsborough Bay were the highest of any sites measured in the bay.</p>	<p>Farmers used granular chlordane mixed with fertilizers for broad-spectrum insect control on fields. Also applied occasionally as a liquid spray for some beetles, and on golf courses. Agricultural and urban runoff are among the major documented sources.</p>
	<p>Mirex - Neuro-toxic pesticide; also known as Dechlorane. Sublethal effects in the marine environment include decreased algal growth, reduced fish growth, disrupted blue crab behavior, reduction in body weight and body lipid in salmon. Sublethal effects in birds include reduced reproductive capacity. Causes tumors in rats and mice. Mammalian symptoms include weight loss, enlarged livers, altered liver enzyme response, reproductive failure, fetal abnormalities including cataracts, heart defects, scoliosis and cleft palate. Concentrations of mirex in oysters from Tampa Bay are relatively high compared to many other sites around the nation. Production of mirex discontinued in 1977. Highest concentrations in bay sediments at Boca Ciega Bay, Mullet Key and Cockroach Bay.</p>	<p>Widely applied by aircraft to control fire ants on pastures between 1965 and 1978. Also used as fire retardant in electrical components, fabrics and plastics. Sewage sludge also a potential source.</p>
	<p>Endosulfan - Hazardous neuro-toxic pesticide with acute toxicity to marine organisms, high bioconcentration factor and fairly long half-life. Although not widely sampled for in Tampa Bay, endosulfan has been recorded in sediments from Cockroach Bay and in stormwater from an industrial park in West Tampa.</p>	<p>Introduced about 30 years ago and widely used to control winged insects associated with many row and field crops. Applied as a liquid spray to crops.</p>
	<p>Dieldrin - Pesticide for soil-dwelling insects including termites. Sublethal effects include starvation, liver damage, immunological suppression, decreased fertility, postnatal mortality. A carcinogen for some animals and a mutagen in cell cultures. Highest levels in bay sediments reported at the mouths of the Hillsborough River and Boca Ciega Bay.</p>	<p>Widely used from 1950-1974 to control soil insects on cotton, corn and citrus. All uses banned in 1985 except subsurface termite control and some mothproofing. Dieldrin is a breakdown product of the pesticide aldrin, both of which are long-lasting in soils and not highly water-soluble.</p>
PCBs/PAHs	<p>PCBs - Among the most persistent and toxic of organic compounds. Most risk of cancer from consumption of contaminated seafood attributed to PCBs. Biomagnifies. Manufacture ended in 1976. PCBs at sites in Hillsborough Bay exceed Florida's Probable Effects Level (PEL) for biological effects from toxic contaminants. PCBs also found in sediments at Boca Ciega Bay near Cross Bayou.</p>	<p>Formerly employed in a wide variety of industrial applications including insulation in electrical capacitors and transformers; paints, additives, adhesives, and caulking compounds; hydraulic fluids. Sources to environment are varied including direct discharge from production facilities into municipal sewage systems, leaching from disposal sites, refuse incineration and reuse of transformer oil.</p>
	<p>PAHs - Many PAHs are potent carcinogens or mutagens. Highest levels in bay sediments found in Hillsborough Bay near Davis Islands and the Alafia River, Boca Ciega Bay, and Middle Tampa Bay near Papys Bayou.</p>	<p>A group of related compounds present in crude oil and its products, released to the atmosphere during combustion. Also released from burning of non-petroleum substances, such as wood (brush fires). Sources include treated sewage, stormwater runoff and oil spills. Suspected sources include aerial fallout, petroleum refinery wastes, and discharges of drilling fluids.</p>

pesticides. Agricultural runoff from pastures and rangelands, which cover roughly 28 percent of the watershed, account for another 13 percent of total bay nitrogen loadings. Forests and wetlands (at 7 percent) and mining (at 4 percent) comprise the remainder of nitrogen loadings in stormwater runoff.²³

ATMOSPHERIC DEPOSITION

Coastal waters of the United States receive large quantities of nutrients, heavy metals and chemicals from the air — and Tampa Bay is no exception. Until recently, atmospheric deposition (pollutants carried in rainfall and dryfall, which consist of small particles and aerosols) had not been identified as a significant problem for Tampa Bay. Studies now suggest that about 29 percent of the bay's total nitrogen loadings are from atmospheric pollutants falling directly on the water.²⁴

Nitrogen loadings from atmospheric deposition are actually much higher when pollutants falling in the watershed are included, since many of these will eventually enter the bay in stormwater runoff. About 1,100 tons of nitrogen is estimated to fall on the open bay each year in rainfall and dryfall. Another 6,600 tons fall in the watershed, although experts can't say how much of that reaches the bay. EPA estimates that as much as 67 percent of the bay's total nitrogen load could come from the atmosphere.²⁵

Several forms of nitrogen are contained in rainfall and dryfall to Tampa Bay. Nitrogen oxides (NOx) — mostly linked to power plant and vehicle emissions — are chemically transformed in the air, eventually returning to earth in aerosol or dissolved forms, such as nitric acid and other soluble nitrates in rainfall. Combined emissions from motor vehicles and power plants contributed almost 70 percent of the total nitrogen oxides that fell to the earth in the United States in 1984. Industrial sources provided another 15 percent.²⁶

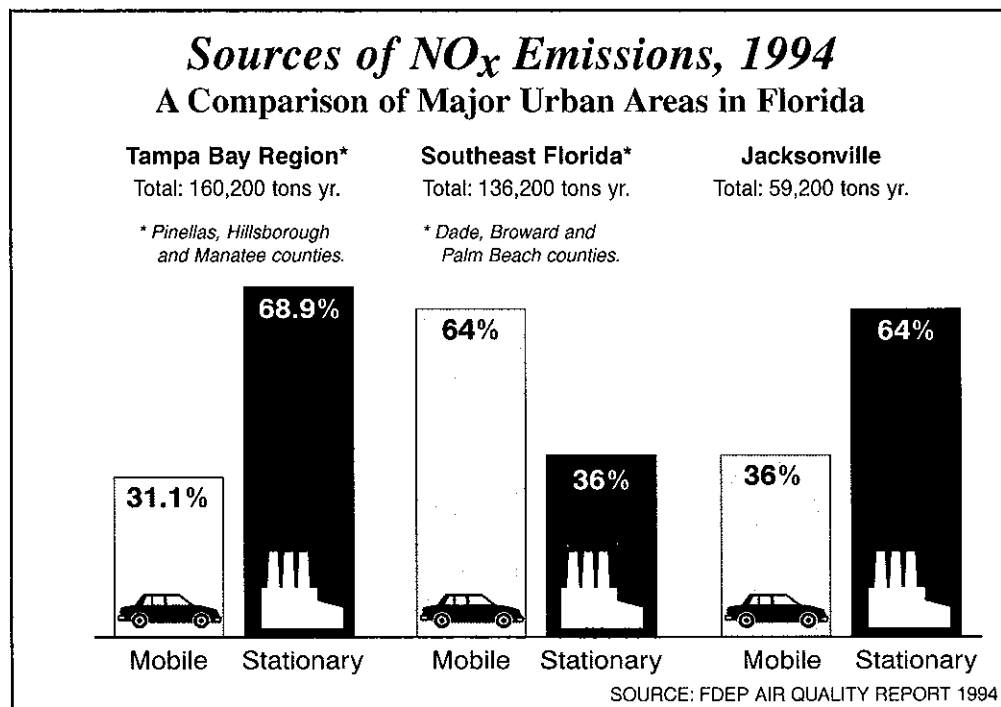
In the Tampa Bay region, stationary sources (primarily power plants) contribute an estimated 70 percent of the manmade NOx emissions as compared to 30 percent from motor vehicles.²⁷ One utility, Tampa Electric Company — which operates two coal-fired power plants on the bay — is the single largest source of NOx emissions in the region. According to the EPC of Hillsborough County, these two facilities emitted approximately 90,000 tons of NOx in 1994, representing nearly two-thirds of the total NOx emissions for Hillsborough and Pinellas counties.²⁸

However, researchers can't say how much of what is emitted locally stays in the region or what percentage of emissions from outside the region are deposited here, since air-borne contaminants may travel hundreds (or even thousands) of miles before settling to Earth. They also can't pinpoint what portion of nitrogen loadings from the atmosphere comes from natural sources, such as lightning. Additional research on natural and man-made sources and the relative contributions from local and distant sources is needed to effectively manage atmospheric deposition in Tampa Bay, which is expected to increase as population, power consumption and motor vehicle traffic grow.²⁹

Between 1995 and the year 2010, nitrogen loadings to the bay from all sources are expected to increase by about 7 percent, or 17 tons per year.³⁰ But those estimates do not include changes that could occur as a result of new and unforeseen industrial discharges to the bay, or increased power generation at local utilities. Florida Power & Light (FP&L) Company's request to burn the controversial new fuel called Orimulsion,

Sources of Nitrogen Oxide

Figure 8



Emissions data presented includes major stationary sources and "on-road" mobile sources, excluding other mobile sources such as boats.

for example, would have resulted in increased activity at its Manatee County plant. That increase in power generation would have resulted in an additional 20 tons of nitrogen loadings to the bay each year, according to the company. FP&L's request to burn the fuel was denied in April 1996 by the Governor and Cabinet in a 4-3 vote. The decision is now being appealed.

Toxic substances also enter the bay from the atmosphere in large quantities. For example, studies estimate that 44 percent of the bay's total cadmium loading, and about one-sixth of its copper and lead loadings, come from the air.³¹ PAHs also enter the bay from the atmosphere, although loadings and specific sources are unknown. PAHs are associated with fossil fuel combustion, such as power plant and motor vehicle emissions and waste incineration.

WASTEWATER

While advances in wastewater treatment and increased regulation have helped reduce pollution, permitted sewage treatment plants and industries discharging directly to the bay ("point" sources) still contribute substantial pollutants to Tampa Bay.

Municipal sewage treatment plants in the watershed contribute about 10 percent (or 360 tons) of the bay's total annual nitrogen loadings.³² Although all sewage treatment plants with surface discharge to the bay or its tributaries now provide Advanced Wastewater Treatment, roughly 36 billion gallons of effluent are still discharged to the bay each year, with Hillsborough Bay receiving the largest portion. In 1991, this bay

segment received two-thirds of the cumulative nitrogen load from domestic wastewater treatment plants discharging to the bay.³³

Wastewater discharged from industrial facilities in the Tampa Bay watershed is responsible for about 4 percent of total nitrogen loadings.³⁴ Fertilizer manufacturing and shipping facilities are the largest industrial point sources.

Industrial and municipal point sources also are a major pathway for toxic substances, contributing roughly 30 percent of the bay's total loadings of arsenic, cadmium, chromium and copper, as well as low levels of other contaminants.³⁵ Residents also can contribute to the problem by pouring down drainpipes toxic cleaners or solvents that local sewage treatment plants cannot completely remove.

OTHER SOURCES

Septic tanks, which are estimated to serve about 20 percent of the watershed's populace, also are a key part of the pollution puzzle in localized sectors of Tampa Bay. Preliminary studies conducted for the Southwest Florida Water Management District (SWFWMD) suggest that nitrogen loadings from septic systems, as well as septic waste and sewage treatment sludge, contribute as much as 4 percent to the bay's overall nitrogen loadings.³⁶ Older septic systems located near the bay pose a particular threat to water quality, since most are not designed for nitrogen removal.

Disposal of sewage sludge poses a special problem, particularly in the Hillsborough and Manatee river basins, because of the number of permitted disposal sites. Different agencies regulate disposal sites and it is difficult to determine how much material is being spread and how it is handled. Additionally, some of the sludge disposed of in the Tampa Bay watershed actually comes from outside the region.³⁷

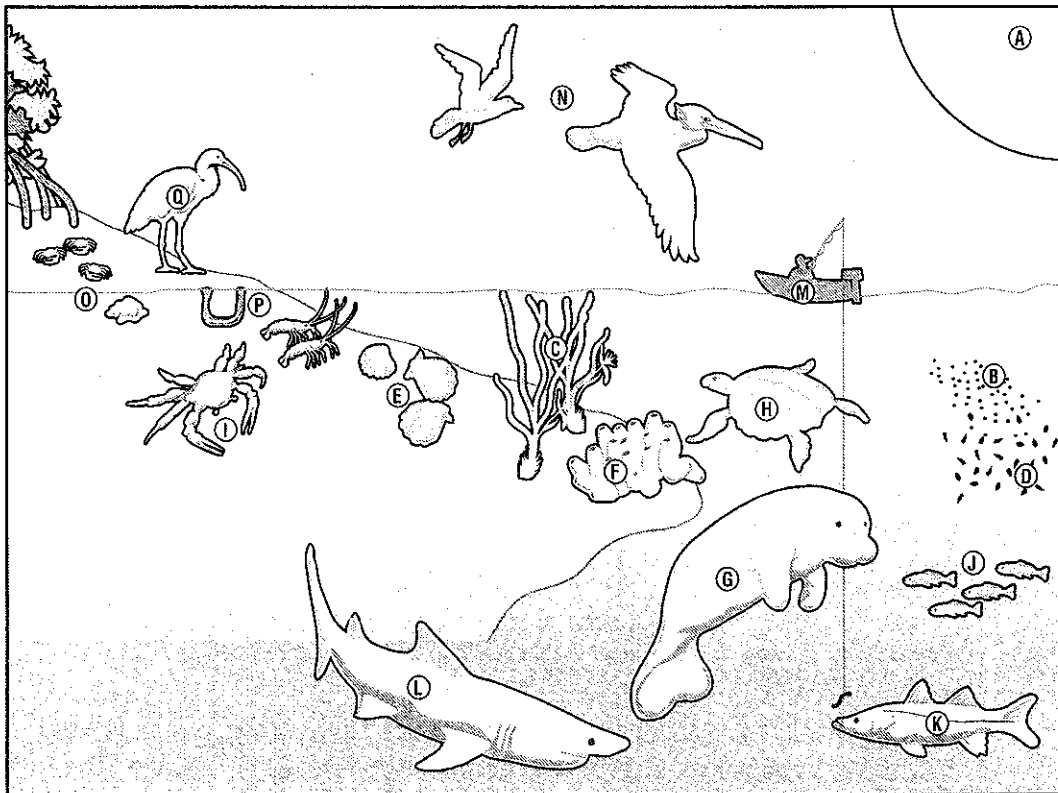
High densities of mostly older septic tanks can contribute to degraded water quality (nutrients and pathogens) in creeks where circulation is limited and the water table is near the ground surface. Pinellas County's Allen's Creek and several creeks in Hillsborough County are among those thought to be at risk.³⁸ Septic systems along tributaries leading to Tampa's McKay Bay also are believed to be a problem.³⁹ Springs that feed into the bay's rivers and smaller tributaries also may be impacted by septic tank leachate, especially in areas with very porous soils.⁴⁰

Preliminary estimates developed for the NEP suggest that ground water and springs contribute about 5 percent of the bay's total nitrogen loadings.⁴¹ Nitrogen (particularly nitrate) concentrations in springs in the area appears to be increasing, possibly due to changes in land use in the spring recharge areas.⁴²

Another 7 percent of the bay's total nitrogen loadings is attributed to fertilizer lost during shiploading and landside on route to port.⁴³ However, the amount has declined substantially since 1991 as a result of efforts to improve portside facilities.

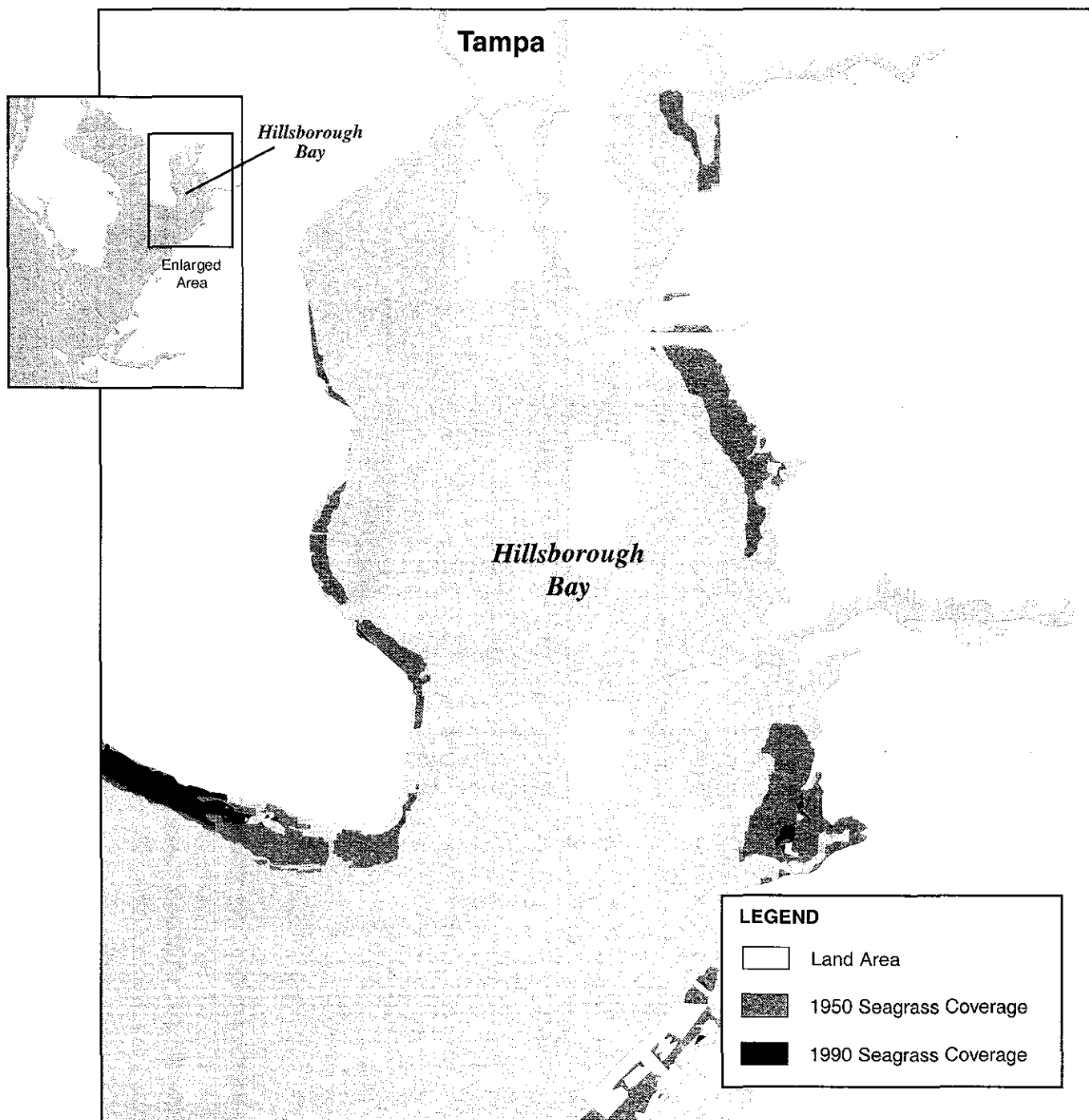
BAY HABITATS

While many bay animals prefer the open water of the estuary, others require the food and shelter supplied by various structural habitats, including seagrasses, mangroves, salt marshes and uplands. Together, these habitats form a natural network that sustains vast populations of fish, birds and other wildlife.



Tampa Bay's food web provides a "who eats who" perspective of the ecosystem. But in reality, it is far more complex. The marine food web, as its name implies, travels in various directions, bound together by common, interdependent threads. Impacts to any part of the food web affect the health of the whole.

- The bay's food web begins with sunlight^A, which penetrates through the water column.
- The sun's energy is absorbed by tiny one-celled organisms called phytoplankton^B, microscopic algae that are the most prolific of the bay's primary producers. Light also is absorbed by seagrasses^C and other underwater plants. There are 270 species of phytoplankton in Tampa Bay, and a single quart of bay water may contain as many as 1 million of these minuscule creatures, which give the water its greenish cast. By comparison, the bay supports only four major seagrass species.
- Small grazing animals called zooplankton^D and larger bottom-dwelling filter feeders form the next thread in the web. Filter feeders such as the bay scallop^E and the sea squirt^F are a prime cleaning service for the bay, siphoning in water containing phytoplankton, skimming off the tiny organisms, and discharging clear water. Larger herbivores, such as manatees^G and green sea turtles^H, consume bigger plants like seagrasses.
- Carnivores and omnivores (opportunistic feeders that eat plants and animals) prey on the zooplankton and the filter feeders. Small carnivores such as the blue crab^I and pinfish^J are in turn eaten by larger carnivores such as snook^K, redfish and trout, which are eaten by sharks^L, dolphins and humans^M. Some birds, such as pelicans^N and cormorants, also eat the small fish and invertebrates.
- When plants and animals die, their remains sustain another thread in the web, the scavengers. Some of these, such as fiddler crabs^O and snails, live in burrows along the shoreline. Others, like worms and shrimp^P, dwell in the muds at the bottom of the bay. The muds of the shore and bay bottom may look barren to a casual observer, but they teem with life.
- The scavengers begin another circle of life, providing food for a variety of shorebirds such as the white ibis^Q and the roseate spoonbill, which frequent the bay's shallows. Small mammals such as raccoons also prey on crabs and snails.



Since 1950, pollution and dredging in the heavily industrialized Hillsborough Bay sector have claimed more than 90 percent (or 2,277 acres) of seagrasses. This compares to an overall seagrass loss in the bay of almost 40 percent (15,200 acres) for the 1950-1990 period. Recent improvements in water quality are beginning to reverse the course of seagrass declines. From 1982-1992, scientists have documented the return of more than 4,000 acres of seagrass baywide, including 20 acres in Hillsborough Bay. Seagrass coverage in Hillsborough Bay has more than doubled since then.

SOURCE: SWIM (1994) AND R. JOHANSSON (1995)

Seagrass transplanting also may be viable in some areas of the bay, although its success rate varies and it is still experimental. Pioneering efforts by scientists at the Florida Marine Research Institute (FMRI) show promise in laboratory cultivation of plant fragments for large-scale restorations.⁵³ And some local transplanting projects, such as the City of Tampa's in Hillsborough Bay, have been successful.⁵⁴ The NEP will evaluate suitable areas for transplanting projects as part of its overall seagrass recovery strategy.⁵⁵ Continued monitoring will be necessary to document the trends in seagrass regrowth.

Although more than 40 percent of seagrasses reveal little or no damage from boat propellers, seagrass scarring is nevertheless an important problem in some parts of the bay. Studies by the FMRI indicate that about 27 percent of Tampa Bay's seagrasses are moderately to heavily scarred — second in severity only to the Florida Keys.⁵⁶ Signs of chronic damage are evident around many passes and channels. Studies at Weedon Island Preserve suggest that propeller scars in turtle grass may take more than five years to heal.⁵⁷

Intense scarring at Cockroach Bay in southern Hillsborough County and at Pinellas County's Ft. DeSoto Park has prompted boating restrictions and other measures in these areas to protect seagrasses.⁵⁸ Channel marking and education appear to be the most effective techniques for reducing damage to grass beds.⁵⁹

The quality of the bay's seagrasses, and their utilization by animals, has not yet been fully evaluated. However, the SWFWMD recently modified its seagrass monitoring program to include assessments of seagrass quality at 60 locations around the bay. Monitoring parameters include seagrass species diversity, density and quantity of epiphytic algae attached to the grass blades, as well as physical parameters such as salinity, pH and water depth.⁶⁰

SOFT-BOTTOM

More than 80 percent of the bay bottom is sand or mud, although the term "soft bottom" can be misleading since a large part of the bay floor is actually hard-packed sand and shell.⁶¹ These bottom sediments support a large variety of organisms, including parchment worms, clams, tunicates (or sea squirts) and conchs. The surface sediments of this dynamic habitat are periodically churned up and re-deposited by bottom-dwelling animals, as well as by waves, currents and dredging.⁶² More than 500 types of macroinvertebrates baywide and an average of 10,000 organisms per square meter were documented in 1993 — the first year of benthic sampling conducted by the EPC of Hillsborough County and Manatee County for the Tampa Bay NEP.⁶³

Dredging of navigation channels and underwater disposal of dredged material have impacted an estimated 14,400 acres of bay bottom, mostly in deep-water areas of the bay. An additional 1,200 acres of deep-water soft bottom has been filled to create spoil islands and causeways.⁶⁴

The long-term effects of disposal on these soft-bottom habitats has not been well documented. However, the benthic monitoring program established in 1993 by NEP and the bay's three surrounding counties will eventually enable scientists to assess trends in the quality of these bottom communities. Samples are taken each year during the critical monitoring period (September and October) at more than 100 stations, and

Mangroves and marshes also support juvenile fish, such as snook, tarpon, red drum and mullet, and protect them from larger predators. Mature mangroves in quiet lagoons and canals in fairly high-salinity areas provide an important nursery habitat for snook.

Mangroves in Tampa Bay are particularly vulnerable to damage or destruction from periodic freezes, since the bay is near the northern limit for these species. This underscores the importance of maintaining a healthy abundance of these wetland habitats. Dense stands of mangroves not only are better equipped to survive a freeze, they also provide more food and better habitat for the animals they support.

Pruning of mangroves can affect their productivity. Public outcry against a 1995 law that made it easier for residents to trim mangroves prompted the Florida Legislature to revisit the issue in 1996. A new mangrove trimming bill was passed, reinstating some trimming restrictions and providing additional penalties for violators. State officials do not know how many acres of mangroves were trimmed during 1995, but say the damage was severe in many cases.

About 21 percent (5,128 acres) of Tampa Bay's original saltwater wetlands were destroyed between 1950 and 1990, primarily due to dredging and filling for waterfront development. These losses were not distributed equally among bay habitats, with the greatest declines documented for tidal marshes (38 percent), followed by salt barrens (36 percent) and mangroves (13 percent).⁷⁰

The steepest declines occurred during the 1950s and 1960s, when efforts to develop coveted waterfront property for residential and commercial uses proceeded unchecked. The passage of wetlands protection laws during the mid-1970s and 1980s has greatly slowed the rate of loss, and studies indicate a slight increase in tidal wetland coverage since 1982, due to recent habitat restoration efforts and natural colonization of marshes and mangroves along causeways and other filled lands.⁷¹

Recent estimates of wetland habitat in Tampa Bay indicate that about 18,800 acres of mangrove forests and salt marshes remain.⁷² However, thousands of acres of these native habitats have been displaced by invasive exotic plants, such as the Australian pine and Brazilian pepper.

MUD FLATS AND SALT BARRENS

Mud and sand flats along the bay's perimeter also are an important part of the estuarine wetland system. While these largely non-vegetated areas may appear barren and lifeless to an untrained eye, they are highly productive and valuable.

On closer inspection, so-called "non-vegetated" shallow bottom areas more closely resemble a secret garden teeming with microscopic plant life. Invisible to the untrained eye, single-celled algae and bacteria proliferate here, giving the bay floor a subtle brown or greenish cast. What's more, these diminutive residents pack a sizeable punch as fuel for the bay's primary productivity. Indeed, in shallower ecosystems, the sheer number of these bottom-dwelling organisms often exceeds the amount of phytoplankton in overlying waters.⁷³

Mud flats support a diverse community of bottom-burrowing creatures, including

worms, clams and crabs, which are pursued by wading birds and raccoons foraging for food at low tide. At high tide, fish enter the flats in search of food.

These areas also are prime feeding areas for a number of migratory birds, including ducks, gulls, avocets and several species of sandpiper, which seek refuge in Tampa Bay each winter.

Fewer than 900 acres of salt barren remain, mostly along the bay's southeastern rim.⁷⁴ Historical estimates of this habitat are unavailable. Salt barrens forms in areas where brackish water moves in during very high tides and evaporates, creating open stretches of salty, dry soil. This hyper-saline terrain supports low-growing succulent plants and serves as a seasonal feeding habitat for wading birds.

ASSOCIATED UPLANDS

Neighboring upland habitats of pine forests, hammocks and shrubs also have been heavily impacted by development. Often overlooked or undervalued, these buffer areas and associated freshwater wetlands provide important habitat for numerous animals, including the wood stork, white ibis, osprey, bald eagle and Sherman's fox squirrel. Many of the birds and animals that live in coastal wetlands or along the shore hunt for food in upland forests and fields. Likewise, many upland species depend on adjacent wetlands for survival.

Almost all coastal pine forests, which are critical nesting sites for bald eagles, have been eliminated from the shores of Tampa Bay, and about 40 percent of this habitat has been lost throughout the watershed.⁷⁵ Coastal hammocks also have declined. Coastal hammocks of live oaks and cabbage palms occur in patches where wetlands transition to uplands, and are home to raccoons, bobcats, foxes and other animals that feed in neighboring wetlands.

LOW-SALINITY HABITATS

The bay's four major rivers — the Hillsborough, Alafia, Manatee and Little Manatee — and more than 100 smaller tributaries provide critical low- and medium-salinity habitat for numerous species of fish and shellfish at early stages in their development. Variations in the salt content of the water, from the low-salinity reaches of the bay's tributaries to full-strength sea water at the mouth of the bay, determine which areas of the estuary are inhabitable for some species and not for others. Oysters, for example, flourish in low-salinity areas of the bay where they are protected from snail predators. Similarly, fish with wide salinity tolerances use low-salinity areas in rivers to avoid predators that cannot tolerate these conditions.

Called oligohaline from the Greek oligos (small) and haline (salty), the low-salinity areas occur in the upper reaches of the bay's tributaries, where salinities range from zero to 10 parts per thousand (ppt), as compared to about 35 ppt at the mouth of Tampa Bay. Downstream, mesohaline or medium-salinity zones occur within a salinity range of 11 to 19 ppt.

Low and medium-salinity habitats are a primary nursery for red drum, snook and tarpon, as well as numerous non-game species such as the striped mullet. Some of the most highly productive juvenile nursery habitat occurs where these low-salinity waters

overlap with shoreline or submerged vegetation. As the fish mature, they typically move to more saline zones in the estuary or out into the Gulf of Mexico.⁷⁶

Efforts to protect these highly productive nursery habitats depend on maintaining the proper timing and flows of fresh water and salt water within the bay's tributaries. Four major tributaries — the Hillsborough River, Palm River (Tampa Bypass Canal), Manatee River and Braden River — have dams or reservoirs that divert fresh water to serve the region's drinking water and irrigation needs. During dry season, when water demand is highest, reservoirs on the Hillsborough, Palm and Manatee rivers release almost no water downstream.

Local water supply development plans may further reduce the flow of fresh water into already impacted tributaries and bay segments. For example, the Tampa Water Resource Recovery Project would remove up to 50 million gallons per day (mgd) of fresh water currently discharged to Hillsborough Bay from the City of Tampa's sewage treatment plant, and possibly reduce flows to the Tampa Bypass Canal and McKay Bay. However, the project also will remove a major source of excess nitrogen to the bay. An environmental impacts assessment will be conducted as part of this project.⁷⁷

Additionally, the West Coast Regional Water Supply Authority proposes to remove 7 mgd from the Alafia River during the first phase of its 1995 Water Resource Development Plan (1995-2000).⁷⁸

The impact of reservoirs on the low and medium-salinity habitats downstream is the subject of several ongoing assessments. One study of flow variations on the Manatee River indicates that, on average, river area and volume within the low-salinity band were reduced 33 percent and 22 percent, respectively, as a result of reservoir operations for the period 1982-1992. Consequently, the area of wetlands coinciding with this low-salinity band was reduced by 150 acres, or 25 percent.⁷⁹

Modeling comparisons of historic and modern landscapes indicate that net freshwater inflows to the main body of Tampa Bay have changed little since the 1950s, assuming the same amount of rainfall each year.⁸⁰ This is mainly a result of increases in urban and agricultural stormwater runoff, which have countered decreases in freshwater flows from rivers. However, long-term measurements of river flows by the U.S. Geological Survey indicate that some rivers in southwest Florida (including the Hillsborough River) have experienced gradual freshwater declines since the 1930s, partly because of declining rainfall.⁸¹

Fish and Wildlife

FISHERIES

The populations of many sport and commercial fish species in Tampa Bay are in a state of flux. Anecdotal reports from sport fishermen indicate some species such as snook and red drum are responding positively to fishing regulations designed to increase their numbers. On the other hand, commercial landings of black (or striped) mullet and spotted seatrout are significantly below historical catches.

A constitutional ban on gill netting, triggered in part by declining mullet stocks, took effect in July 1995. Supporters believe the ban will lead to increases in mullet popula-

tions, which are fished almost exclusively by commercial netters. The ban also may benefit other species like spotted seatrout and sheepshead, targeted by both commercial and recreational fishermen.

Bait fish such as menhaden and herring also were targeted for increased protection following precipitous declines in bait fish landings in the late 1980s. The 1993 ban on purse seining in the bay is expected to stabilize bait fish populations, as well as benefit other fish and birds that feed on the bait fish.

Careful monitoring of fish populations will be necessary to gauge the effectiveness of these existing regulations and determine the need for further management actions.

Until recently, resource managers have had to estimate populations of important fishery species in Tampa Bay from landings data because direct measurements were not available. These data, which record the amounts and types of fish brought to Pinellas and Hillsborough docks by area fishermen, indicate that 3.7 million pounds of 11 commercial species of finfish were harvested from the bay in 1990 — a decrease of 24 percent since 1966. The decrease is largely due to reduced catches of mullet and sea trout, while landings for the remaining species stayed the same or increased slightly.⁸²

However, records going further back, to 1950, show that harvests of spotted sea trout declined 86 percent in the bay by 1990, from 487,000 pounds to 67,000 pounds. Similarly, red drum harvests plummeted from 80,000 pounds in 1950 to 15,000 pounds in 1986, the last full year of available data prior to a statewide ban on commercial red drum harvests.⁸³ These raw data do not reflect changes in fishery management plans or quotas.

Prior to the net ban, mullet was the most sought-after commercial species in the bay, comprising almost half of the 1992 landings of finfish and shellfish, or 2.3 million pounds. By comparison, bay harvests of spotted seatrout and bait shrimp were only 40,000 pounds and 26,000 pounds, respectively.⁸⁴

Although useful, landings can be a misleading indicator of population stocks because natural fluctuations and changes in market demand, gear efficiency and fishing regulations may affect them. Additionally, commercial landings are often under-reported and tend to decline as recreational fishing increases. Recognizing this, the FMRI in 1989 initiated a Critical Fisheries Monitoring Program (CFMP) to provide more reliable estimates of stock sizes and distribution of important species and key prey species. The research also is helping clarify the crucial role habitat plays in the life cycles of many species.

A summary of results of the first three years of the CFMP (1989-1991) found that 78 percent of the juvenile spotted seatrout collected were captured over seagrass beds, further validating the importance of seagrass habitat to this species. Small red drum were found in relative abundance in the bay's major tributaries, while small snook are known to frequent at least two of the rivers, the Alafia and Little Manatee.⁸⁵

Mirroring declines in fish stocks, Tampa Bay's once-thriving commercial shellfish industry also has virtually collapsed, although bait shrimping and some food shrimping continues. Harvests of clams and oysters throughout the bay are restricted or prohibited because of documented or potential bacterial contamination from fecal col-

iform associated with human and animal wastes entering the bay in stormwater runoff. In the few unrestricted areas remaining, shellfish populations are not large enough to support commercial harvest.

However, reassessments of closed or restricted areas are not routinely performed by the state, and it is possible that actual water quality conditions in specific areas do not warrant the restrictions. That's because decisions to classify or reclassify areas in most cases are based on land use considerations and the documentation of or potential for contamination following a major storm event, rather than actual water quality conditions.⁸⁶

The bay's fisheries also are impacted by entrainment, the capture of planktonic eggs and larvae of fish and shellfish in power plant cooling intakes. The five power plants around Tampa Bay take in a daily average of about 2.3 billion gallons of bay water. An estimated 274 billion fish eggs and 83 billion fish larvae are captured annually in cooling intakes in Tampa Bay, according to power plant monitoring data from the early 1980s.⁸⁷

Assuming 100 percent mortality, the impact of steam electric plants on the fishery stocks of Tampa Bay may be significant. However, in the absence of sufficient baseline data on stock sizes and normal survival rates, it is difficult to fully assess this impact. Further evaluation is needed to understand the cumulative impacts of power plant entrainment on the bay's fisheries.

Habitat declines, water quality and fishing impacts are considered the primary factors responsible for changes in fish populations. The relative impact of each factor is often hard to discern because of natural fluctuations in stock sizes.

Despite these pressures, improving water quality and restoration of habitats throughout Tampa Bay are creating more favorable conditions for fish and shellfish and for the seagrass habitats they require. One potential beneficiary is the bay scallop, which all but disappeared from Tampa Bay in the 1960s. While experts can't say why the scallop departed decades ago, they suspect these highly sensitive creatures were casualties of pollution. Water quality in Tampa Bay now has improved to levels that may support scallop recovery,⁸⁸ and some restocking efforts have been undertaken.⁸⁹

Mortality for scallops transplanted in the bay was unacceptably high in 1995, according to a 1996 report from the FMRI for the Tampa Bay NEP. Researchers say red tide — a common Gulf coast nemesis — is likely to blame. FMRI believes that bay scallops can be successfully cultured and reintroduced to Tampa Bay, but recommends selecting a variety of transplant sites within the lower bay to minimize exposure and localized impacts.⁹⁰

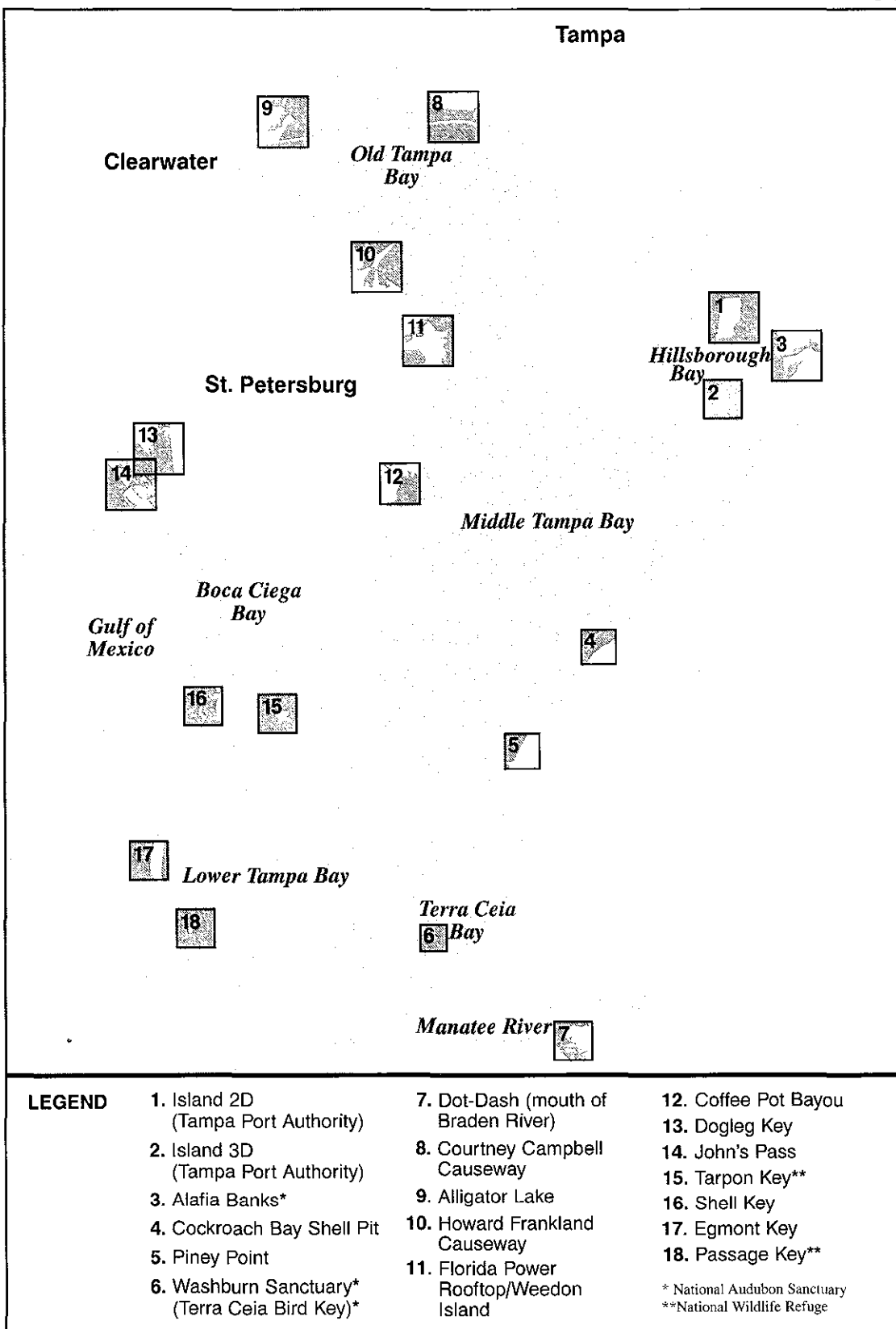
BAY WILDLIFE

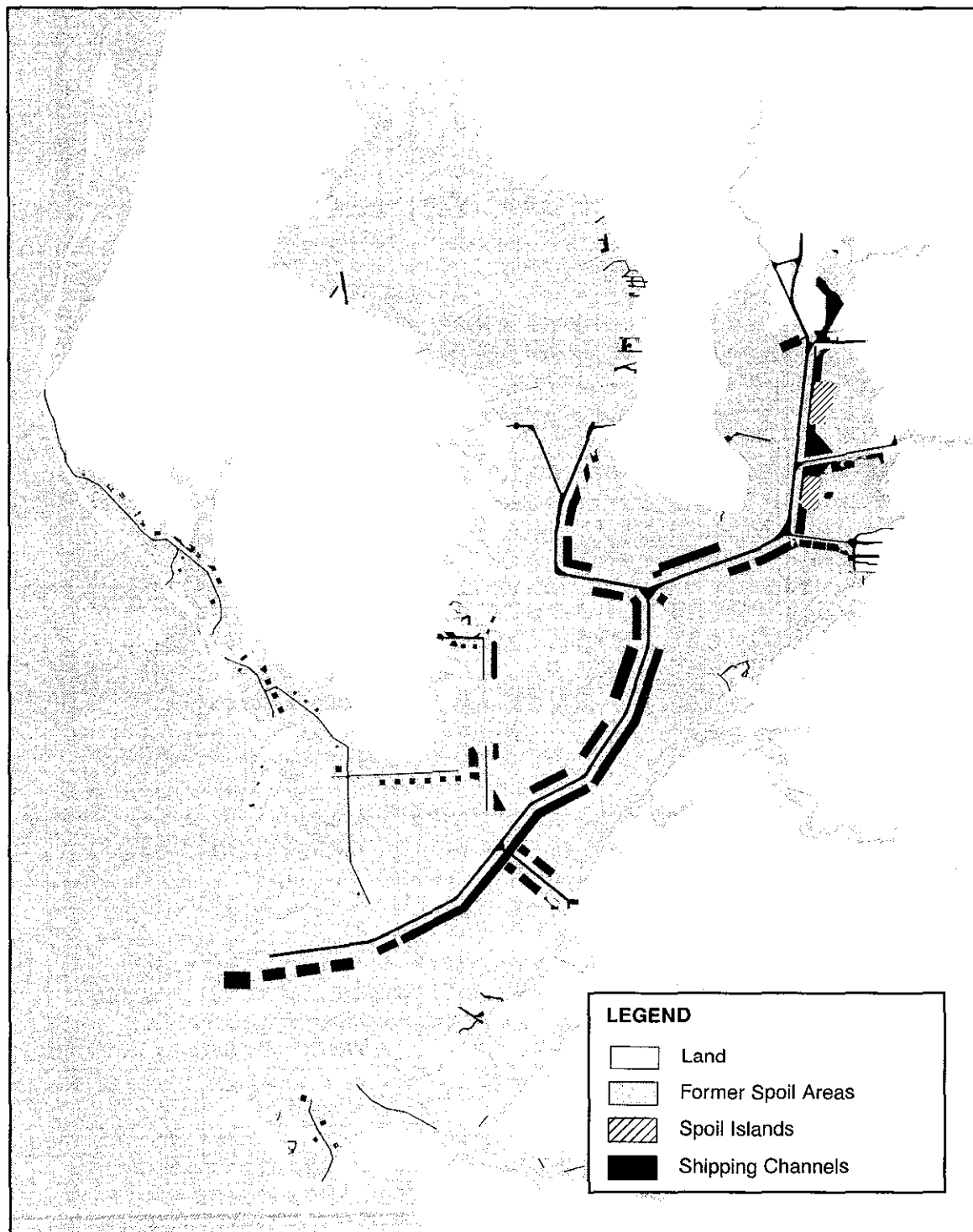
Tampa Bay supports a magnificent array of wildlife, from the familiar brown pelican to the bottom-hugging sea squirt. But many of these animals also are threatened by impacts to water quality and habitats.

Birds are perhaps the most easily recognized and appreciated creatures in the ecosystem, and mangrove islands in the bay are among the most important nesting sites in

Important Bird Nesting Colonies of Tampa Bay

Figure 13





SOURCE: COASTAL ENVIRONMENTAL, INC.

Effective long-term planning and coordination among ports, the U.S. Army Corps of Engineers, and environmental and business interests is needed to explore long-term disposal options, including beneficial uses of spoil material, and to minimize the ecological impacts of dredging.

Spill Prevention and Response

More than 4 billion gallons of oil and other hazardous materials pass through Tampa Bay each year on large vessels that must navigate relatively narrow channels. Another 18 million tons of refined fertilizer products and phosphate rock are exported from the bay area annually.¹⁰³ Sulfuric acid and anhydrous ammonia, used in the processing of fertilizer, routinely traverse the bay en route to fertilizer processing facilities.

While this bustling nautical highway brings billions of dollars in economic rewards to the region, it also poses an environmental risk to the bay and underscores the need for effective spill prevention and response.

That risk was brought home to area residents in dramatic fashion in August 1993, when two barges and a freighter collided near the mouth of the bay in a fiery collision that resulted in a spill of nearly 330,000 gallons of oil.¹⁰⁴ Winds and tides pushed most oil offshore, and the quick response of federal, state and local agencies and the maritime industry helped to spare the bay serious damage. Still, oil coated numerous seabirds, fouled area beaches and blanketed small mangrove islands in the Intracoastal Waterway, with cleanup costs borne by industry and government exceeding \$100 million.¹⁰⁵

Cooperative efforts led by the U.S. Coast Guard (USCG), Florida Department of Environmental Protection and Tampa Bay Regional Planning Council have been lauded for providing critical advance planning and response for such accidents. Local governments, shipping interests and utilities are also a part of this local advance planning network. However, the spill pointed out several important equipment, planning and navigational needs that could help avoid similar tragedies in the future. In particular, officials have pledged renewed efforts to focus on ways to prevent spills from occurring.

Public concerns about the impacts of oil spills on the bay were heightened again when Florida Power & Light proposed to burn Orimulsion at its Manatee County plant. Because the thick, emulsified fossil fuel disperses in the water column rather than floating on top where it can be skimmed off, removal with current cleanup and containment technology would be nearly impossible.

Thanks to existing safety protocols, large spills have been relatively rare in Tampa Bay. In fact, small spills averaging 25 gallons or less constitute 95 percent of the 422 spills reported in the Tampa Bay region from April 1993 through September 1995.¹⁰⁷ Many more small spills go undetected. Efforts to address these smaller, chronic discharges are vitally important, since their cumulative impacts may be substantial.

Small spills occur frequently at dockside as boats are refueled. Oily bilge water also enters the bay from smaller craft when bilge pumps are discharged. Leakage and spills

Subsequent state legislation, through the Wilson-Grizzle and Grizzle-Figg initiatives, required all sewage treatment facilities discharging to the bay to meet advanced treatment standards.

The city of St. Petersburg chose another route to address its sewage disposal problems when it pioneered the first large-scale wastewater reuse program in the state, resulting in almost zero discharge to the bay. However, the city had problems during abnormal wet weather conditions with discharges into Boca Ciega Bay caused by unintentional sewer overflows during the late summer of 1995.

In the late 1960s, the Environmental Protection Commission (EPC) of Hillsborough County was established. Over the years, the EPC has provided a comprehensive record of long-term water quality record in the bay — critical for tracking and documenting the “bad old days” and the bay’s progressive recovery. EPC was one of the first agencies to identify sewage treatment problems in the bay, and its wetlands protection rules are among the strictest in the state.

A decade later, the Hillsborough Environmental Coalition, a grass-roots citizens group, led efforts to fight environmental impacts associated with the Tampa Harbor Deepening Project. The Coalition supported Manatee County’s legal actions against the federal government regarding the proposed dumping of dredged material from the project into the Gulf of Mexico. The group also worked to improve coordination of coastal land acquisition, efforts which would eventually lead to the establishment of Hillsborough County’s Environmental Lands Acquisition and Protection Program (ELAPP). Efforts such as these reinforced the importance of bridging jurisdictional boundaries to effectively protect the Tampa Bay ecosystem.

Residents continued to exert pressure to clean up the bay, and that groundswell of support reached the state Legislature in the early 1980s. The Legislature established a bay study commission composed of elected officials and interested citizens to examine ways to improve bay protection. The study commission resulted in the formation in 1985 of an advisory group, the Agency on Bay Management (ABM). An arm of the Tampa Bay Regional Planning Council (TBRPC), the Agency has become a vigilant guardian of the bay. The 45-member coalition — which includes elected officials, regulators and representatives of special interest groups and local governments — has been successful in focusing public attention on bay problems and in bringing together diverse and often competing bay users.

The Legislature also established four Aquatic Preserves in the Tampa Bay watershed to protect remaining natural areas. Stricter permitting standards apply within the preserves, which encompass more than 370,000 acres of submerged lands in Hillsborough, Pinellas and Manatee counties.

Stormwater permitting for new development was initiated in the mid-1970s by the Florida Department of Environmental Protection (FDEP) and later delegated to the Southwest Florida Water Management District (SWFWMD). In 1984, SWFWMD adopted new rules for the management and storage of surface waters, launching a comprehensive surface water management program for new development which included permitting requirements for stormwater treatment as well as flood control.

In 1987, the Legislature created the Surface Water Improvement and Management (SWIM) program to restore and protect the state's most threatened waterways. At the urging of the ABM, Tampa Bay was named in the SWIM Act as a priority waterbody within SWFWMD. Since 1989, SWIM has created or restored more than 110 acres of estuarine and coastal habitats and provided stormwater treatment for more than 5,000 acres of urban lands in the bay watershed.

Despite the progress that has been made, many bay managers believe the bay still lacks a comprehensive and cohesive protection scheme. Thus, widespread support was given in 1990 to Tampa Bay's adoption into the National Estuary Program by EPA to assist the region in developing a comprehensive conservation and management plan for the bay.

A required step in that process is identifying where unnecessary duplication exists in current environmental programs to ensure that limited public funds are spent in the most effective manner.

BAY MANAGEMENT EXPENDITURES, OVERLAPS AND GAPS

Management of Tampa Bay is currently shared by dozens of federal, state, regional and local agencies and by different departments within those agencies. A short list includes the EPA, the U.S. Army Corps of Engineers, the FDEP, the TBRPC, the SWFWMD, and the Tampa Port Authority, which has been deeded all state-owned or sovereign bay bottom in Hillsborough County. On the local level, resource management is divided among county and city planning, stormwater, solid waste, wastewater, and environmental protection departments.

A 1994 survey conducted by the Tampa Bay NEP attempted to quantify how much money is spent to manage and monitor bay quality and administer environmental programs. That study, based on FY94-95 budgets, indicates that more than \$250 million is spent annually by federal, state and local agencies and governments on the restoration and management of Tampa Bay.

By far, the largest portion of that figure — 68 percent or roughly \$170 million — is attributed to wastewater collection, treatment and reuse, activities which directly or indirectly benefit the bay even if they aren't performed solely for the bay's benefit. The second largest allocation of about 14 percent or \$35 million is expended primarily by local governments and the SWFWMD for stormwater management, including handling and treatment. Regulation and enforcement activities comprised 5 percent or \$13.5 million of total expenditures. Habitat restoration, preservation and management totalled approximately \$7 million or nearly 3 percent, excluding land acquisition expenditures (nearly 4 percent). Dredging and dredge material management, environmental monitoring and public education comprised the remainder of the expenditures (See Figure 15).

The bay's complex management system has led to duplications in some areas and gaps in others. Bay managers who responded to the NEP's 1994 survey generally agreed that duplications occur most frequently in permitting activities, while gaps are most evident in enforcement and monitoring programs. Bay managers also cited turf-guarding as a problem, and noted the lack of a comprehensive, readily available data

base through which valuable information about the bay's health and living resources could be shared.

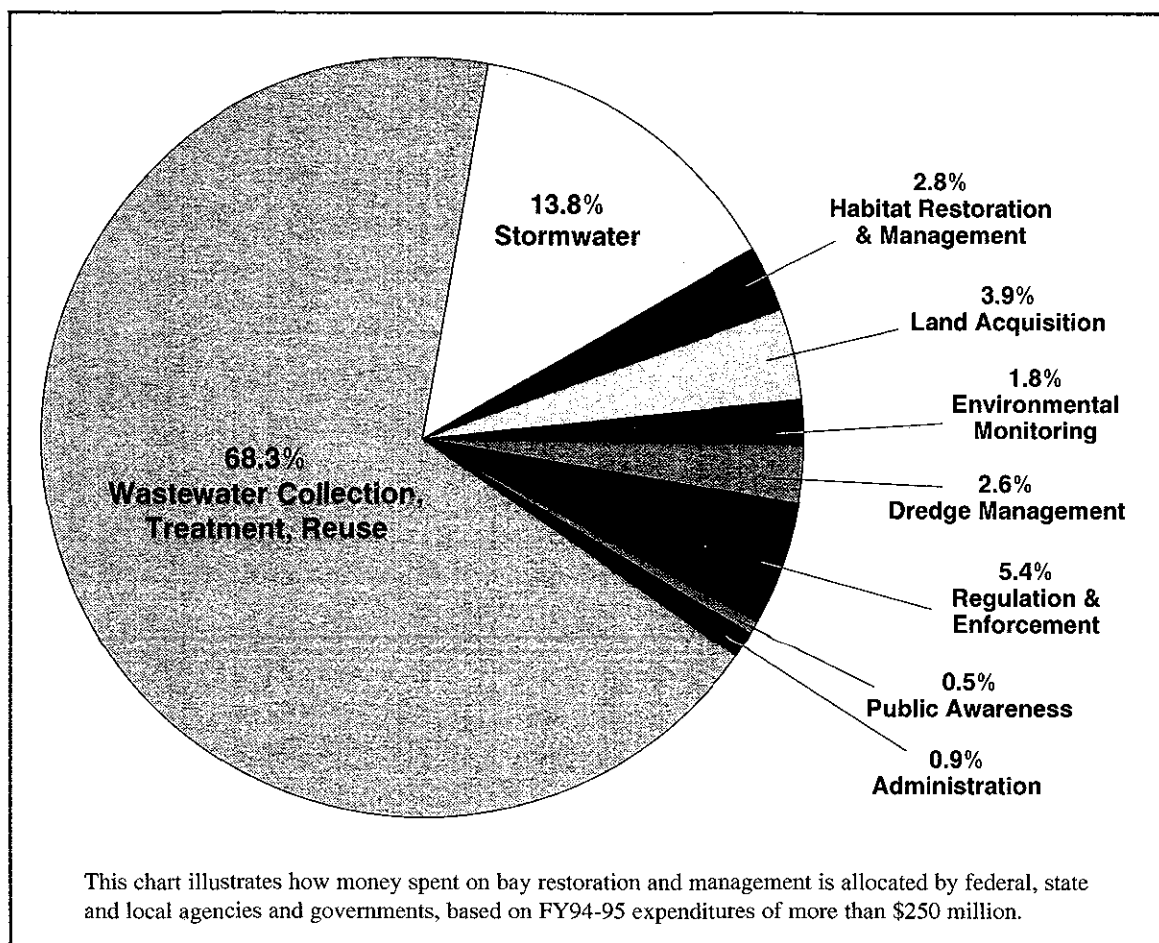
The permitting arena serves as an example of what some believe is unnecessary duplication of effort. An applicant seeking permission to remove or alter wetlands along the bay may have to obtain permits from as many as half a dozen agencies, depending on the extent of wetland impacts and the project's location.

That process was streamlined in October 1995 as a result of the state's new Environmental Resource Permit (ERP), which consolidated review of existing dredge-and-fill, stormwater management and sovereign lands permits into a single permit to be issued by either FDEP or the water management district, depending on the type of project.

SWFWMD now utilizes a "cradle-to-grave" system, in which one person oversees all facets of a given permit, from review and approval to compliance monitoring and

Bay Management and Related Expenditures Federal, State and Local (FY94-95)

Figure 15



SOURCE: HAZEN AND SAWYER (1996), *FUNDING SOURCE INVENTORY FOR CCMP ACTION PLANS*. PREPARED FOR THE TAMPA BAY NATIONAL ESTUARY PROGRAM

enforcement. This approach is highly efficient because it provides responsibility for all follow-up activities to the staff member most familiar with the project.

Inconsistencies also characterize the permitting process. Because communities have adopted individual wetlands rules based upon their residents' perceptions of important environmental concerns, an applicant's project could be denied by one agency and approved by another. If the project is approved, the applicant could be required to meet widely varying mitigation and monitoring requirements imposed by each regulatory agency.

Until recently, publicly financed restoration projects were further complicated by state agency requirements that they undergo the same rigorous review as private projects — even when the reviewing agencies have participated in the development of the restoration design. This process increased the cost of the project and often delayed construction by a year or more. The SWIM program, however, has made progress in streamlining the process based on its record of success, close monitoring and reporting to regulatory agencies, and monthly meetings with all jurisdictional agencies. Additionally, the new ERP process waives monitoring requirements for restoration projects.

Many bay managers believe that permitting is given too much emphasis in the regulatory arena, while monitoring and enforcement are short-changed. Lack of adequate enforcement personnel has been identified by the FDEP as a principal reason why so many mitigation projects required of private developers have either not been properly constructed, or constructed at all. This is true not only for mitigation projects, but also for stormwater facilities. The disparity is prevalent throughout the regulatory community, according to bay managers who responded to the estuary program survey, and may be as much a function of allocation of resources rather than the fault of the regulatory system itself. There are exceptions, such as Hillsborough County's EPC, which devotes a substantial portion of its resources to compliance and enforcement.

A NEW APPROACH TO BAY MANAGEMENT

Shrinking public funds, combined with increasing demands for government services and increasing public scrutiny of expenditures, are providing new challenges for resource managers. In the future, they will be pressed to spend money even more judiciously and on programs that yield quantifiable results.

Concurrently, attitudes about environmental management are shifting away from an emphasis on piecemeal oversight and toward a holistic view that assesses the cumulative impacts of human actions on entire natural systems. This approach is called "Ecosystem Management."

Many bay managers believe the amount of money spent on Tampa Bay is sufficient to adequately manage it, but that it should be redirected. In particular, they advocate a shift in some resources from permitting to monitoring and enforcement. They also support pro-active projects, such as habitat restoration, so long as these projects provide meaningful results and effectively address ecosystem needs. Support also is growing for cooperative partnerships such as team permitting, a concept that is being pursued by the FDEP as part of its Ecosystem Management initiative.

Those managers see Ecosystem Management as more effective than traditional resource management, since it relies less on micro-reviews of individual permits and more on assessing overall impacts. A critical component of successful Ecosystem Management is using biological living resources — such as seagrass, fish and scallops — as a measure of the bay's health. Such an approach allows regulators the flexibility they need to achieve realistic, long-term goals and provides taxpayers with a better benchmark to judge the return on their investments.

Ecosystem Management also emphasizes the role that watersheds and tributaries play in Tampa Bay's overall health. A new SWFWMD initiative will focus attention on these vital areas through the creation of "watershed teams" which will prepare and implement detailed plans for key watersheds.

Making Ecosystem Management a reality in the Tampa Bay watershed will require a strong management plan backed by a stronger administrative structure that is less cumbersome, more accountable, and committed to addressing ecosystem needs. Bringing this plan to life within the existing bay management structure will be an important focus of the Tampa Bay NEP in overseeing implementation of the master plan for Tampa Bay.

Goals and Priorities for Tampa Bay

Charting the Course advances specific goals and associated strategies to restore and protect water quality and bay habitats, as the foundation for healthy and diverse populations of fish and wildlife. These goals and priorities for Tampa Bay are the focal point of the master plan for Tampa Bay and the subject of this chapter.

When the Tampa Bay National Estuary Program was formed in 1991, local government and regulatory agency partners pledged to participate with citizens and scientists in the development and implementation of a Comprehensive Conservation and Management Plan for Tampa Bay. Efforts by the Program's technical advisors over the past five years have centered on developing specific resource goals as long-term measures of success in implementing the bay restoration blueprint.

These goals for Tampa Bay, and the foundation for establishing them, are profiled below and in the accompanying chart, which also identifies priority actions.

GOALS FOR WATER & SEDIMENT QUALITY

Water quality goals focus on maintaining the proper water clarity to support seagrasses by controlling nitrogen, which continues to be a major concern in Tampa Bay. Excess nitrogen in rainfall, stormwater runoff, and from domestic and industrial point sources accelerates the growth of algae in the bay, limiting light penetration to seagrasses, which require sunlight to grow. Past water quality declines contributed to the loss of nearly half of the bay's seagrasses (or almost 19,000 acres) from the 1950s to the 1980s, although seagrasses are gradually returning in areas of the bay where water quality has improved.

In July 1996, the Tampa Bay NEP adopted a five-year management goal to cap nitrogen loadings to the bay at existing levels (1992-1994 average). This effort is expected to provide water quality conditions suitable for the regrowth of more than 12,000 acres of seagrass over time. Nitrogen loadings to Tampa Bay are expected to increase 7 percent by 2010, or about 17 tons per year, as a result of population growth. Therefore, local governments and industries will need to offset loadings to the bay by this amount to maintain existing nitrogen loadings. The NEP will revisit the nitrogen goal and associated management strategies every five years, or more often, as significant new information becomes available.

Local government partners have tentatively agreed to reduce their future nitrogen loadings to the bay by at least 6 tons per year — that portion of the load which is

attributed to stormwater runoff and discharges from municipal point sources. A nitrogen management consortium of key industries, local governments and regulatory agencies has been established to develop a plan to address the remaining 11 tons of nitrogen, which comes from atmospheric deposition, industrial point sources, fertilizer shipping and handling, and intensive agriculture.

Toxic contaminants in bay sediments represent another primary focus of concern for Tampa Bay. Studies by the National Oceanic and Atmospheric Administration (NOAA) and the Florida Department of Environmental Protection (FDEP) in the late 1980s and early 1990s documented relatively high levels of pesticides, heavy metals and other contaminants in sediments, and associated impacts to marine life at some bay sites.

The goal is to protect relatively clean areas of the bay from toxic contamination, and minimize risks to bay wildlife and humans associated with contamination in impacted areas.

Results of recent risk assessment conducted for the Tampa Bay NEP indicate that some contaminants are present at concentrations high enough to be harmful to fish and wildlife, either through direct exposure or indirectly via the food web. The first phase of the risk assessment, completed in 1996, evaluated the risk to human health and marine life from contaminants in Hillsborough Bay and Boca Ciega Bay, two of Tampa Bay's most impacted sectors.

Contaminants of concern identified in the study include several metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and chlorinated pesticides. Most of these pollutants enter the bay in stormwater runoff or through atmospheric deposition. An action plan to address toxic contaminants in the bay and outline more specific management goals will be developed by November 1997, following completion of the second phase of the risk assessment.

Recent events also have focused the attention of citizens and bay managers on problems associated with sanitary sewer overflows and discharges to the bay during heavy rainstorms. That problem came to light during the summer of 1995 when the City of St. Petersburg was forced to discharge about 15 million gallons of untreated sewage into Boca Ciega Bay to minimize sewage backup into homes. Excessive rainfall had infiltrated the wastewater collection system and caused the overflows. Other communities around the bay and nationwide have experienced similar problems during periods of heavy rainfall. To keep the bay safe for swimming and shellfish harvesting in the future, local communities will need to grapple with infrastructure improvements that will ensure that the significant investments made to upgrade sewage treatment facilities are not diminished by chronic failures in collection networks.

GOALS FOR BAY HABITATS

The restoration and protection of seagrasses is a key goal of *Charting the Course*, which establishes a nitrogen management strategy to encourage seagrass recovery. The goal is to restore 12,350 acres and protect the bay's existing 25,600 acres of grass beds. This is based on restoring the vital underwater seagrass meadows to 1950s levels, except in areas that have been permanently altered. It will be achieved largely by

controlling the bay's nitrogen intake—although other factors, such as turbidity and water color, also influence seagrass regrowth.

More than 4,000 acres of new or expanded seagrass beds have been documented in the bay since 1982, thanks to improvements in water quality. But recovery will be a long-term process because of the time it takes for seagrasses to recolonize an area once conditions have improved. For coastal habitats, the plan is to restore the historic balance of coastal habitats in order to better support the bay's fish and wildlife populations, recognizing that some vital habitats have declined more rapidly than others. Declines have been particularly severe for tidal streams and tributaries, which are critical nurseries for numerous species of fish, such as snook and mullet.

The goal is to restore at least 100 acres of low-salinity tidal stream habitat every five years, for a total increase over time of 1,800 acres, while preserving existing salt marshes and mangroves. This may be accomplished either through habitat restoration or enhancement of existing areas that have been severely degraded. Strategies outlined in the plan build on existing efforts, including SWFWMD's practice of creating "habitat mosaics."

The NEP habitat restoration and protection master plan, available under separate cover, also identifies 28 sites as priorities for protection, either through direct purchase or methods such as conservation easements. The majority of these sites have been designated by SWFWMD as priorities for acquisition in their Save Our Rivers/Preservation 2000 plan.

While the plan's primary focus is on repairing tidal streams, other habitats also will be gradually restored. A key effort will be to identify and restore small freshwater ponds that are critical to the survival of the white ibis, which lives along the bay but depends upon freshwater crayfish and insects to feed its young. Additional work is planned for upland forests, mud flats and salt barrens (extremely salty high marsh), all of which play an important role in the Tampa Bay ecosystem.

The NEP also seeks the establishment of adequate freshwater inflows to Tampa Bay and the lower reaches of its tributaries, particularly from rivers impounded by dams. This is essential to preserving the overall health of the estuary. A schedule for establishing these flows has been set for the bay's major rivers. NEP will participate with SWFWMD in this process by convening an advisory group to develop technical recommendations for flows on the Hillsborough River and Palm River/Tampa Bypass Canal.

GOALS FOR FISH & WILDLIFE

While the Tampa Bay NEP has not adopted any specific goals for increases in fish and wildlife species, the goals established for water quality and habitat restoration will provide direct benefits for fish, birds and other bay inhabitants by improving the areas in which they live, reproduce and feed.

Reductions in nitrogen loading and increases in seagrass coverage, for instance, will assist efforts to increase fisheries and return the bay scallop to Tampa Bay by providing suitable water quality and habitat. Achieving the NEP's seagrass recovery target

also will help the bay's population of endangered manatees, which feed in seagrass beds.

Birds, too, will benefit from the goals set forth in the NEP's habitat restoration master plan, which will assure protection and enhancement of existing habitats important for feeding and nesting, and increase other habitats, such as salt barrens and freshwater ponds, which have been severely reduced because of development.

Additionally, preserving the flow of fresh water into the bay from its myriad tributaries will yield dividends for a variety of commercially and recreationally valuable fish, which seek out these sheltered, low-salinity havens as nurseries.

OTHER BAY IMPROVEMENT GOALS

Other goals, aimed at improving spill prevention and response and dredging and dredge material management, are equally important in preserving the bay's health and promoting cooperative planning.

The goal for spill prevention and response is the installation of a state-of-the-art Vessel Traffic and Information System (VTIS) that employs a combination of shore-based radar and global positioning technology to monitor and control shipping traffic in the bay. The system would greatly reduce the likelihood of an economically and environmentally devastating spill of oil or other hazardous materials.

Charting the Course also calls for the development of a long-term, coordinated dredging and dredged material disposal plan, directed by the U.S. Army Corps of Engineers and involving the bay's three major seaports. The plan would address long-term disposal needs, seek to reduce the environmental impacts associated with dredging, and maximize beneficial uses of material dredged from the bay's shipping channels.

MEASURES TO ENSURE SUCCESS

Local government and agency partners have pledged to continue their participation in the NEP to ensure regular dialogue, review actions and evaluate progress toward meeting the bay's goals. Continued monitoring of the bay's health also is essential to this process (see Monitoring Bay Improvement). This allows policy leaders and bay managers to adjust management actions as necessary to keep the plan on track.

Sustaining broad-based citizen support for bay restoration and protection will be equally vital to the success of the plan. The Tampa Bay NEP will continue strong community outreach and education efforts as the plan is implemented. These efforts are discussed in the chapter on Public Education and Involvement Action Plan.

An overall theme expressed in various action plans is to better utilize existing federal, state and local resources to carry out recommended actions. A strong focus on compliance monitoring and enforcement also is emphasized throughout the plan and in specific actions to ensure that environmental regulations are followed.

CHARTING the COURSE:

Charting the Course, the Tampa Bay National Estuary Program's management blueprint for Tampa Bay, details progress made in restoring and protecting Florida's largest open-water estuary and strategies for continuing improvements well into the next century. The following goals and priorities have been adopted by the Tampa Bay Management Conference and will be the focal point of the implementing agreement signed by NEP partners in 1997.

Water & Sediment Quality

Aided by laws requiring construction of better sewage treatment facilities and improvements in stormwater management, water quality in Tampa Bay is improving. However, excess nitrogen and toxic contaminants continue to be key concerns. Goals for improving water and sediment quality include:

- Preventing increases in the bay's nitrogen levels to provide water clarity suitable for the gradual recovery of 12,350 acres of seagrass. To maintain existing water quality conditions, local governments and industries will need to reduce their future nitrogen contributions to the bay by about 7 percent by the year 2010, or approximately 17 tons per year.
- Reducing the amount of toxic chemicals in contaminated bay sediments and protecting relatively clean areas of the bay from contamination.
- Gaining a better understanding of the role that air pollution plays in the bay's water quality, and identifying and addressing the sources of air pollution.
- Reducing bacterial contamination now present in the bay to levels safe for swimming and shellfish harvesting.

Status: *Local government partners in the NEP have tentatively pledged to reduce their future nitrogen loadings to the bay by about 6 tons per year - that portion of bay loadings attributed to stormwater runoff and municipal point sources. A Nitrogen Management Consortium of local utilities, industries, agricultural interests, local governments and environmental agencies was established in 1996 to develop a plan to address the remaining balance of 11 tons of nitrogen per year, which is expected to come from atmospheric deposition, industrial point sources, fertilizer shipping and handling, and intensive agriculture. See Action WQ-1 for details.*

Ongoing studies of atmospheric deposition (Action AD-1) and toxic contaminants (Action TX-1) are improving bay managers' understanding of these important issues. Action PH-1 calls for the development of maintenance plans by local governments to address sewer overflow problems.



Bay Habitats

Water quality improvements are aiding the return of seagrasses to the bay, but other habitats - particularly tidal streams and marshes critical to fish and wildlife - also will require a concerted, long-term restoration effort. Goals and priorities for improving bay habitats include:

- Recovering an additional 12,350 acres of seagrass over 1992 levels, while also preserving the bay's existing 25,600 acres and reducing propeller scarring of seagrasses.
- "Restoring the historic balance" of coastal wetland habitats in Tampa Bay by restoring at least 100 acres of low-salinity tidal marsh every five years, for a total increase over time of 1,800 acres.
- Preserving and enhancing the bay's 18,800 acres of existing mangrove/salt marsh habitats, including the 28 coastal habitat sites designated as priorities for protection, either through public purchase or methods such as conservation easements.
- Establishing and maintaining adequate freshwater flows to Tampa Bay and its tributaries to increase crucial low-salinity habitat.

Status: *More than 750 acres of new or expanded seagrass beds have been documented since 1992; by preventing future increases in nitrogen entering the bay, water clarity should be sufficient to achieve seagrass recovery goals. Details on progress in habitat restoration and protection are provided in Action BH-1. A schedule for establishing minimum freshwater flows from impounded rivers was adopted by SWFWMD in 1996. Action FI-1 provides details.*

GOALS & PRIORITIES OF THE TAMPA BAY PLAN

Fish & Wildlife

Charting the Course seeks to increase the number, diversity and health of the bay's fish and wildlife populations by improving the areas in which they live, feed and reproduce. Restoring water quality and bay habitats will be the primary focus. Another priority to bolster fish and wildlife populations in the bay is:

- Improving the on-water enforcement of fishing and environmental regulations.

Additionally, *Charting the Course* calls for the establishment of a working group of the Agency on Bay Management to evaluate and develop recommendations for local manatee protection zones.

Status: See Actions WQ-1, BH-1 and FI-1 for updates on efforts to improve water quality and bay habitats. Local enforcement needs are discussed in Action FW-1. Additional recommendations are discussed in the Fish & Wildlife Action Plan.

Spill Prevention & Response

The oil spill that occurred in Tampa Bay in August 1993 spotlights the need for preventive measures to avoid future spills of oil and other hazardous materials, and to ensure rapid cleanup of spills that do occur. The priority for spill prevention and response is to:

- Install a state-of-the-art vessel traffic and information system (VTIS) to improve coordination of ship movements along the bay's narrow shipping channel

Status: NEP approved \$40,000 in 1996 to support improvements to the existing ship monitoring system. This is part of an overall plan by the Tampa Bay VTIS Consortium to develop and implement a Vessel Traffic and Information System; Action SP-1 provides details.

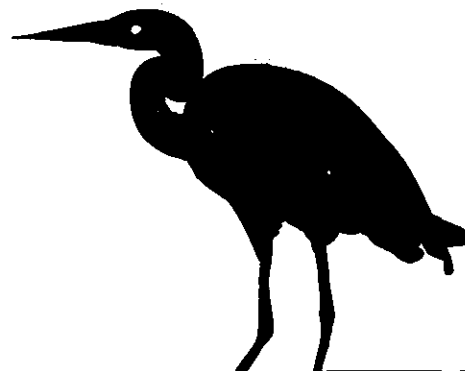


Dredging & Dredged Material Management

Maintenance of the bay's network of navigational channels is important both to commercial maritime industries and recreational interests. But a more coordinated approach is needed to protect the bay from the potentially damaging effects of such activities and address long-term disposal needs. The priority for dredging and dredged material management is:

- Developing a long-range dredged material management plan for the bay that will minimize environmental impacts and maximize beneficial uses of the dredged material.

Status: The NEP has allocated \$40,000 to the U.S. Army Corps of Engineers to begin development of the long-term plan in 1997, in cooperation with local port authorities and bay interests. See Action DR-1.



CHARTING
the **COURSE**
FOR TAMPA BAY

Introduction to Action Plans

The Tampa Bay National Estuary Program was established in 1991 to assist the community in developing a Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay. The CCMP includes six Action Plans for bay improvement, addressing:

- Water & Sediment Quality
 - Nitrogen Management
 - Stormwater Runoff
 - Atmospheric Deposition
 - Wastewater
 - Toxic Contamination
 - Public Health
- Bay Habitats
 - Freshwater Inflow
- Fish & Wildlife
- Dredging & Dredged Material Management
- Spill Prevention & Response
- Public Education & Involvement

Local government and agency partners in the Tampa Bay NEP expect to sign an agreement in 1997 pledging to achieve the goals for water quality and natural resource recovery, as well as priorities for spill prevention and response, and dredging and dredged material management (see preceding chapter).

How those goals are achieved will be left up to individual communities, who may select from among a range of acceptable alternatives. Many of these options are outlined in the following Action Plans for bay improvement. This approach not only emphasizes flexibility, but allows local governments to focus their limited resources in the most cost-effective and environmentally beneficial manner.

Bay Action Plans define the bay's most pressing needs, and present strategies to achieve bay goals and maximize the community's long-term return on investment. Some actions can be implemented quickly and with existing resources. Others will require long-term community commitments. Whenever possible, strategies presented in *Charting the Course* seek to strengthen or redirect existing bay programs to accomplish more with available resources.

Action Plans have been developed with assistance from bay experts and advocates working through the Tampa Bay NEP's management, technical and community advi-

sory committees. Each Action Plan begins with an introduction to the issue followed by the proposed actions. Cost estimates are presented for each action.

A key addition since the release of the draft CCMP in January 1996 is an overall water quality action describing nitrogen management goals for Tampa Bay and the process for achieving them. New information also is provided in the Action Plans on Atmospheric Deposition and Toxic Contamination, including updates on important research already underway.

Preliminary analyses suggest that the cost to meet certain water quality goals for Tampa Bay will be relatively minimal over the plan's lifetime (see Implementation & Financing chapter). For example, local communities and industries will need to reduce future nitrogen loadings to the bay by about 17 tons (or about one-half percent of the total load) per year to maintain water quality levels and provide for continued seagrass recovery. The cost of achieving that goal is estimated at an additional \$2 to \$4 million per year over current expenditures, or about \$2 per bay area resident.

The Tampa Bay NEP invites and encourages your comments as we begin implementation of the management plan for Tampa Bay.

*Bathers at Spa Beach
and City Pier in St.
Petersburg (1925).*



PHOTO: BURGERT BROTHERS

Water & Sediment Quality

Tampa Bay is rebounding from decades of pollution that reached an apex in the 1970s, when vast algal blooms clouded the water in some bay sectors and seagrasses struggled to survive.

Today, water quality improvements are helping to chart a course for the bay's recovery. Since 1982, more than 4,000 acres of seagrasses — which provide life-support to many of the bay's fisheries — have either sprouted in once-barren areas or filled in previously patchy meadows as a result of water quality gains. Improved conditions also may be setting the stage for a recovery of the bay scallop in lower Tampa Bay, which disappeared in the 1960s when the bay was badly polluted.

Most water quality gains are attributed to Advanced Wastewater Treatment technologies, which have significantly reduced nitrogen in wastewater discharged to the bay. Municipal sewage treatment facilities now contribute just 10 percent of total bay nitrogen loadings, as compared to 40 percent in the mid-1970s.

CHARTING
the **COURSE**
FOR TAMPA BAY

WQ

ACTION PLAN

Water & Sediment Quality

Maintaining these water quality improvements as the region grows represents the foremost challenge for the stewards of Tampa Bay. While direct or "point" discharges of pollution to the bay have declined, other sources such as stormwater runoff and atmospheric deposition have increased and are expected to grow as more people settle in the region. Population in the three counties bordering the bay is expected to increase 17 percent to more than 2.3 million by 2010. Without further action, that growth will be accompanied by increases in nitrogen loadings.

Nitrogen and potentially toxic contaminants (including heavy metals and pesticides) are the key pollutants of concern to Tampa Bay. Pollution pathways, including stormwater runoff, atmospheric deposition and wastewater, are summarized in this section. Additional information is provided in the State of the Bay chapter which precedes this section.

Nitrogen is a naturally occurring and beneficial nutrient that pollutes the bay and inhibits seagrass growth when excess amounts are present. In 1996, the Tampa Bay NEP adopted a five-year management goal to cap nitrogen loadings to the bay at existing levels (1992-1994 average). Studies suggest that staying within those limits will provide water quality that is suitable for the regrowth of more than 12,000 acres of seagrass, a key objective of the NEP management plan.

Nitrogen loadings to Tampa Bay are expected to increase 7 percent between 1995 and 2010, as a result of population growth. This equates to an increase of 17 tons per year, or a total of 266 tons per year by 2010. Consequently, local governments and industries will need to offset the bay's total nitrogen loadings to the bay by this amount in order to maintain current nitrogen levels. Action WQ-1 discusses the nitrogen management goals for Tampa Bay and the process for achieving them.

Potentially toxic contaminants entering the bay in stormwater runoff, atmospheric deposition and wastewater represent another important focus of concern for bay managers, following studies that identified high levels of contaminants in sediments at various sites, including Hillsborough Bay and Boca Ciega Bay. While contamination appears to be localized, some biological impacts have been documented and others are anticipated. The persistence of these substances in the marine environment and the prospect of increased contamination associated with population growth support the need for action now before the problem escalates. Risk assessments being conducted for the NEP are helping to identify which contaminants pose the greatest concern in heavily impacted areas.

Local governments already are making significant investments each year in stormwater improvements and pollution prevention in the watershed. These actions will continue to be important catalysts in protecting the bay from pollution. Strategies advanced in the NEP's Water & Sediment Quality Action Plan are designed to focus these substantial efforts and resources to achieve the greatest long-term benefit for the bay.

WATER & SEDIMENT QUALITY GOALS:

- Cap nitrogen loadings to Tampa Bay at existing levels (1992-1994 average) to encourage the regrowth of an additional 12,350 acres of seagrass. To compensate

for anticipated increases in nitrogen loadings, local governments and industries will need to reduce their future nitrogen loadings to Tampa Bay by about 7 percent between 1995 and 2010. A key effort will be gaining a better understanding of the role air pollution plays in the bay's water quality, and addressing the sources of this pollution.

- Protect relatively clean areas of the bay from increases in toxic contamination, and minimize risks to marine life and humans associated with toxic contaminants in impacted areas.
- Reduce bacterial contamination in impacted areas of the bay to levels safe for swimming and shellfish harvesting.

Implement Nitrogen Management Goals for Tampa Bay

WQ-1

ACTION:

Implement the nitrogen management goals for Tampa Bay to maintain water quality conditions suitable for the recovery of more than 12,000 acres of seagrasses.

BACKGROUND:

Controlling the bay's nitrogen intake as a means of regaining vital underwater seagrass beds has been one of the most prominent initiatives of the Tampa Bay NEP. Seagrasses were selected by NEP as a yardstick by which efforts to improve the bay will be measured because of their overall importance to the bay ecosystem, and because they are an important barometer of their environment, signaling changes in long-term water quality trends.

An incredible variety of marine creatures — from the stately seahorse to the blue-eyed scallop to the portly manatee — find food, shelter or protection from predators in these dense underwater pastures. In fact, studies show that seagrass beds harbor 50 percent more fish and invertebrates than sand-bottom areas of the bay. Seagrasses also anchor shifting sand and filter pollutants from the water, much as grasses help stabilize the soil on dry land.

Since the turn of the century, pollution and dredging have destroyed more than half of the bay's seagrass beds. But surveys have recorded more than 4,000 acres of new or expanded seagrass beds in Tampa Bay since 1982, some in areas like Hillsborough Bay that had been barren for decades.

This remarkable comeback is largely credited to improvements in sewage treatment that have reduced the amount of nitrogen flowing into the bay, since excess nitrogen causes algae blooms that cloud the water and keep sunlight from reaching the grasses. Using computer models, scientists with the NEP calculate that water quality is now good enough to allow the natural growth, over time, of more than 12,000 acres of seagrass.

In July 1996, the Tampa Bay NEP adopted a five-year management goal to cap nitrogen loadings at existing levels (1992-94 average) to assist the seagrass recovery process. Nitrogen loadings to Tampa Bay are expected to increase 7 percent by the year 2010 as a result of population growth. This equates to an increase of 17 tons per year, or a total of 266 tons of nitrogen per year by 2010. Consequently, local governments and industries will need to offset loadings to the bay by this amount in order to maintain the bay's current nitrogen levels.

Local government and agency partners already have tentatively accepted responsibility for reducing their future nitrogen contributions by at least 6 tons per year, or 90 tons per year by 2010. This is the amount associated with stormwater runoff and municipal point-source discharges. These partners — Hillsborough, Pinellas and

WQ-1

Manatee counties, the cities of Tampa, St. Petersburg and Clearwater and participating agencies — are now developing plans which identify specific projects to address their share of the cleanup. Nitrogen reductions will be carried over from year to year and credited against the remaining shortfall. Additionally, communities may achieve their target loadings more rapidly by implementing projects with greater nitrogen reductions or preventing anticipated increases.

A Nitrogen Management Consortium was established in October 1996 to develop a plan to address the remaining 11 tons per year of nitrogen, which comes from atmospheric deposition, industrial point sources, fertilizer shipping and handling, and intensive agriculture. Participants also are exploring ways to equitably assign the responsibility for managing nitrogen loadings among dischargers, based on their contribution to the problem.

The Consortium is comprised of local utilities, phosphate mining and fertilizer handling companies and agricultural interests, as well as the NEP's six local government partners and regulatory agencies. Working together, the group will identify nitrogen management projects to satisfy the nitrogen management goals established for Tampa Bay. The NEP will assist the Consortium by developing a list of the most cost-effective projects to pursue.

The approach advocated by NEP stresses cooperative solutions and flexible strategies over rigid "command and control" regulatory requirements. Under this plan, local governments and industries may select from among a range of options — as long as the overall goals for nitrogen management are met. This flexibility allows communities to focus their limited resources on the most cost-effective and environmentally beneficial actions.

Without this consensus-building approach to bay management, regulators would have to rely on the traditional permitting and compliance process to achieve the goals of the bay plan. That method can be more time-consuming and expensive, and lacks the flexibility the NEP partners have endorsed.

The NEP will review and revise nitrogen management goals every five years, or more often, if significant new information becomes available.

STRATEGY:

- STEP 1** Complete local government and agency Action Plans and estimate the total amount of nitrogen reduction associated with these partners' projects.
Responsible parties: local governments, Southwest Florida Water Management District (SWFWMD), Florida Department of Environmental Protection (FDEP)
- STEP 2** Continue the Nitrogen Management Consortium with the goal of developing an action plan to reduce future nitrogen loadings to the bay by 11 tons per year, that portion of the future nitrogen load which is attributed largely to atmospheric, industrial and agricultural sources.

WQ-1

ACTION PLAN

Water & Sediment Quality

- A. Identify all nitrogen management projects completed, underway or proposed by Consortium members since January 1995 for completion by the year 2005.
 - B. Develop a method for determining how much credit each project will receive for nitrogen reduction. In fairness to all participants, a consistent method must be developed for estimating credits both for structural improvements, such as stormwater ponds, and non-structural efforts, such as support for the Florida Yards & Neighborhoods Program.
 - C. Determine the difference between estimated reductions associated with projects that are planned and the nitrogen management goals established for Tampa Bay.
Responsible parties: Tampa Bay NEP, in cooperation with Consortium members
- STEP 3 Develop and implement an Action Plan identifying projects that address any shortfall in nitrogen reduction. The NEP will assist the Consortium by identifying the most cost-effective projects for nitrogen reduction in the watershed.
Responsible parties: Nitrogen Management Consortium, in cooperation with the Tampa Bay NEP

SCHEDULE:

The Tampa Bay NEP has received draft Action Plans from its local government and agency partners. These Action Plans will be finalized for review by the Tampa Bay Management and Policy Boards in 1997 and must be adopted no later than one year after the signing of the Comprehensive Conservation and Management Plan (CCMP) implementing agreement in Spring 1997.

The Nitrogen Management Consortium was established in October 1996. Steps 2 and 3 will be completed no later than one year after the signing of the implementing agreement. The NEP will request a preliminary action plan from the Consortium by August 1997.

COST:

Preliminary analyses suggest that the cost to meet nitrogen management goals for Tampa Bay will be relatively small over the plan's lifetime. Local communities and industries will need to reduce future nitrogen loadings to the bay by about 17 tons (or about one-half percent of the total existing nitrogen load) per year to maintain water quality levels and provide for continued seagrass recovery. The cost of achieving that goal is estimated at an additional \$2-\$4 million per year over current expenditures, or about \$2 per bay area resident per year.

EXPECTED BENEFITS:

Achieving the nitrogen management goals for Tampa Bay will prevent increases in the bay's nitrogen burden and provide conditions suitable for the regrowth of an additional 12,000 acres of seagrasses, which are vital to countless marine animals.

MONITORING ENVIRONMENTAL RESPONSE:

Individual projects will be monitored through regulatory permits. Additionally, NEP will prepare an annual report summarizing progress made by each participant for community and Policy Board review. Details of the overall bay monitoring program are provided in the chapter on Monitoring Bay Improvement.

REGULATORY NEEDS:

To be determined, based on projects identified in action plans.

RELATED ACTIONS:

See stormwater, wastewater and atmospheric deposition actions for discussion of nitrogen management strategies.

WQ-1

STORMWATER RUNOFF

Stormwater runoff carrying fertilizer, pesticides, oils and other contaminants from urban and agricultural lands contributes nearly half of the bay's total annual nitrogen loadings and more than 60 percent of the annual loadings of zinc, mercury, lead and chromium.

Contaminants in runoff come from land-use activities and from air pollutants that settle in the bay's watershed. In fact, air pollutants are believed to be a significant contributor to pollution in stormwater runoff to the bay.

Approximately 15 percent of the bay's total nitrogen loadings is attributed to urban stormwater runoff, an amount exceeding all direct or "point" discharges of wastewater to the bay from wastewater treatment and industrial plants. Of that, 10 percent comes from residential areas, which dominate the urban landscape. Commercial and industrial sites, by comparison, contribute the other 5 percent of total bay nitrogen loadings.

Runoff from intensely cultivated agricultural lands (mostly citrus and vegetable production) contributes another 6 percent of total bay nitrogen loadings, as well as potentially significant quantities of pesticides and sediments from erosion. Agricultural runoff also originates from pastures and rangelands, which cover roughly 28 percent of the watershed and account for another 13 percent of total bay nitrogen loadings.

Compared to lands in intensive agriculture, pastures and rangelands are probably less cost-effective to treat, since total loadings per acre are relatively small (see chart). Undeveloped land (at 7 percent) and mining (at 4 percent) comprise the remainder of nitrogen loadings carried to the bay in stormwater runoff.

Bay water quality is improving, thanks largely to improvements in sewage and stormwater treatment and associated declines in nitrogen loadings. But concerns about toxic contamination of bay sediments are growing, following studies that have revealed concentrations of heavy metals and pesticides harmful to marine life at several sites. Many toxic contaminants enter the bay attached to sediments in stormwater runoff, making treatment of sediments in runoff a key component in the strategy to address toxic contaminants.

In fact, stormwater treatment in conventional wetland retention and detention systems can be highly effective in removing sediments from runoff. However, wetland retention/detention is not as effective for reducing nitrogen. Thus, efforts to reduce nitrogen emphasize strategies such as wastewater reuse and pollution prevention measures, as well as efforts to reduce atmospheric deposition of nitrogen to the bay.

The Tampa Bay National Estuary Program has developed a computer model to assist local governments in selecting the most cost-effective best management techniques to employ in battling stormwater pollution. An overall strategy must focus on pollution prevention, stormwater treatment and monitoring to assure compliance with stormwater permits.

ACTIONS TO ADDRESS STORMWATER RUNOFF

Actions to address pollution from stormwater runoff range from recommendations for improved landscape management and urban planning to increased stormwater treatment. Actions to address agricultural runoff focus on water conservation and integrated pest management.



- SW-1 Continue implementation of the Florida Yards & Neighborhoods Program and similar pollution prevention initiatives.
- SW-2 Assist businesses in implementing best management practices to reduce stormwater pollution, and develop model landscaping guidelines for commercial use.
- SW-3 Encourage local governments to adopt integrated pest management policies and implement environmentally beneficial landscaping practices on public properties.
- SW-4 Reduce impervious paved surfaces, focusing on parking space and design requirements for large commercial developments.
- SW-5 Require older properties being redeveloped to meet current stormwater treatment standards for that portion of the site being redeveloped, or provide equivalent compensation.
- SW-6 Promote compact urban development and redevelopment.
- SW-7 Enforce and require the timely completion of consent orders for the cleanup of fertilizer facilities in Tampa's East Bay sector.
- SW-8 Encourage best management practices on farms.
- SW-9 Improve compliance with agricultural ground and surface water management plans.

ADDITIONALLY...

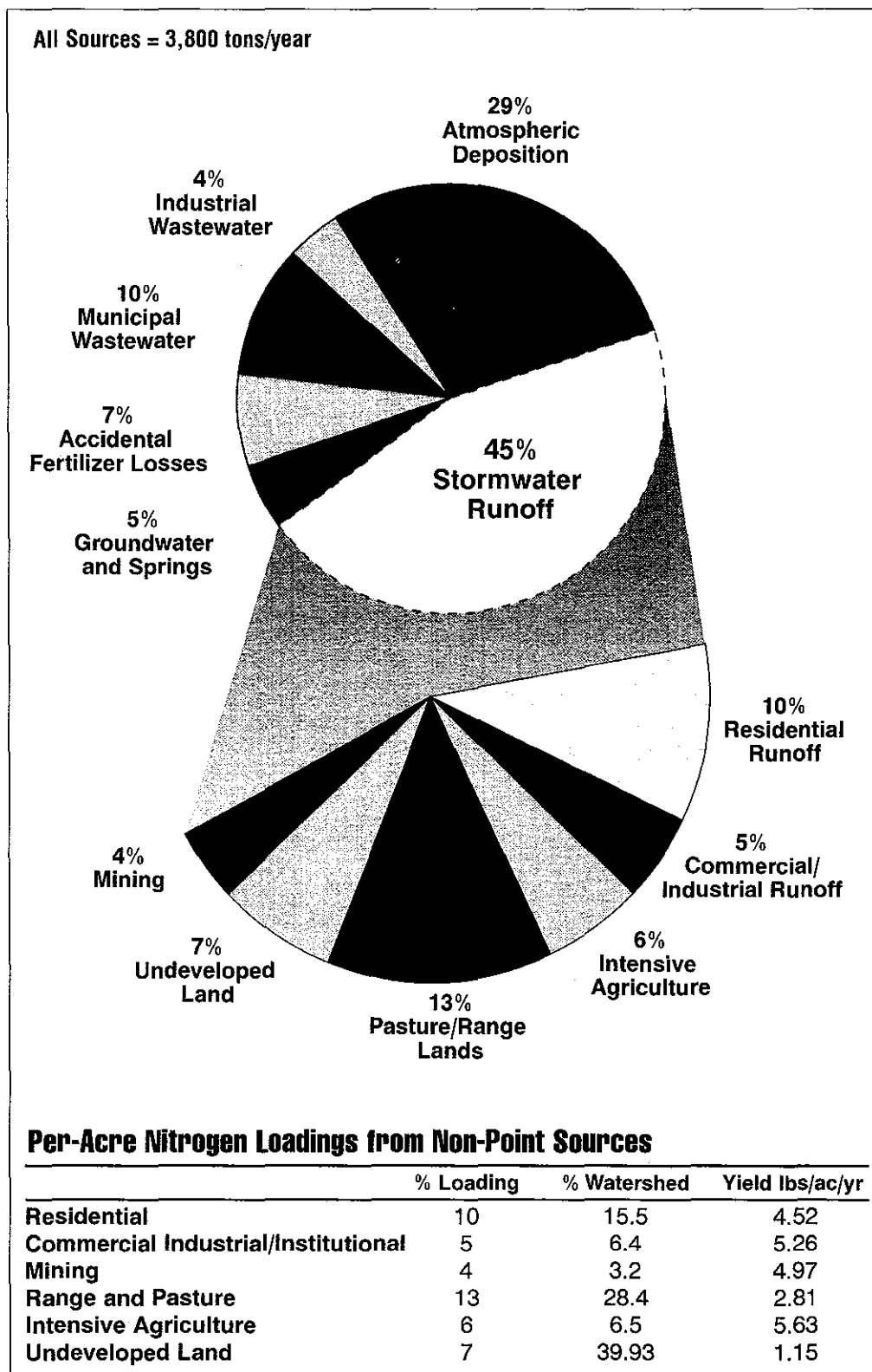
The NEP recommends a workshop in 1997 to discuss the overall issue of compliance monitoring and enforcement of stormwater permits. Compliance monitoring and enforcement was considered a major problem by many advisors to the NEP who helped develop and rank the initial list of actions for the draft Comprehensive Conservation and Management Plan (CCMP) — and is still considered a problem by some people. Many believe that the regulatory system is “front-loaded” — with too many staff allocated to project review and permitting and too few available for compliance monitoring and enforcement. They advocate a shift in resources to address the imbalance. This issue was the subject of an action in the draft CCMP released in January 1996 and requires additional discussion before recommendations are made.

SW

ACTION PLAN

Water & Sediment Quality

Total Nitrogen Loadings to Tampa Bay (1992-1994 average)



SOURCE: COASTAL ENVIRONMENTAL, INC.

Continue Support for the Florida Yards & Neighborhoods Program and Similar Pollution Prevention Initiatives

SW-1

ACTION:

Continue support for the Florida Yards & Neighborhoods Program and similar pollution prevention and education initiatives which encourage homeowners to reduce pollution in residential runoff. Continue to enlist retailers, developers, and the landscaping and pest control industries to practice and promote these concepts.

BACKGROUND:

Yards and neighborhoods are among the bay's first lines of defense against pollution in stormwater runoff. Yet many homeowners fail to understand the potential impact of excess fertilizer, pesticides and water used in landscape maintenance on the health of Tampa Bay.

In fact, scientists estimate that residential land uses in the Tampa Bay watershed contribute about 10 percent of the bay's total nitrogen loadings, as well as other pollutants such as pesticides and herbicides. The impact on Tampa Bay may be immediate in a waterfront neighborhood, or gradual, through the flow of stormwater drains, ditches, streams or rivers.

These findings became the springboard for the development of the Florida Yards & Neighborhoods (FY&N) Program, established in 1991 to enlist residents in pollution prevention by improving their landscaping practices. Experts from the Florida Cooperative Extension Service (FCES), which administers the Program statewide, encourage residents to conserve water and limit their use of fertilizers and pesticides — techniques that can save homeowners considerable time and money. The Program also promotes the establishment of true Florida Yards, featuring plants suited to local conditions, climate and wildlife.

FY&N was developed by the National Estuary Programs of Tampa Bay and Sarasota Bay and the FCES. The West Coast Regional Water Supply Authority (WCRWSA) is currently the major funding source for the Tampa Bay FY&N program, which also draws support from some local governments.

Since its inception, the FY&N Program has assisted dozens of neighborhoods and thousands of individual homeowners through workshops, neighborhood evaluations and plantings, educational literature and the development of model Florida Yards at public venues. The Program also coordinates with local developers and retailers to promote these concepts. A Florida Yard featured in the 1996 Parade of Homes at Fish Hawk Trails in Hillsborough County received extensive publicity and attention. Home Depot recently began publicizing FY&N tips in its in-store literature and advertising inserts.

SW-1

ACTION PLAN

Water & Sediment Quality

This action seeks to continue support for FY&N to effectively reach a larger and more diverse audience in the Tampa Bay region. The NEP also recognizes and supports the efforts of several local initiatives, such as the Hillsborough County Adopt-A-Pond Program, which promote water quality stewardship and neighborhood action.

STRATEGY:

Strategies to continue and expand the FY&N Program, and further enlist developers, retailers and the horticulture/pest control industries in promoting these concepts, are proposed below. The implementation of some strategies will require additional funding.

INDIVIDUAL HOMEOWNERS AND NEIGHBORHOODS

STEP 1 Continue FY&N outreach to organized community and neighborhood associations, with presentations and distribution of the Florida YardStick and the FY&N handbook.

STEP 2 Expand outreach to individual homeowners.

- A. Promote Florida Yard materials and messages at major retail outlets, home and garden shows, public events, and public venues such as The Florida Aquarium.
- B. Pursue arrangements to distribute and bar-code FY&N materials so they may be sold at cost through retail establishments, with revenues tagged for additional reprints.
- C. Increase mass-media publicity efforts and promote the use of existing public service announcements on cable, network and government access stations. Counties also should consider paid media placement campaigns to broaden public interest and awareness of FY&N messages. Media efforts should be coordinated on a regional basis to maximize cost-efficiency and audience reach.
- D. Increase the number of individuals pursuing Florida Yard certification.

Responsible parties: FCES, in cooperation with local governments, WCRWSA and the Southwest Florida Water Management District (SWFWMD)

COST:

Annual costs for staff and materials for program components outlined above are estimated at approximately \$75,000 per county (Hillsborough, Pinellas, Pasco and Manatee). Cooperative funding may be sought from participating local governments, river basin boards of the SWFWMD, WCRWSA, and the Coastal Zone Management Program.

Retailers, Landscape Management and Horticulture Industry

- STEP 1 Pursue partnerships with nursery/garden supply retailers in each county to promote FY&N materials and messages.
- STEP 2 Expand existing training programs, or develop new ones as necessary, to educate retail/landscape management personnel about FY&N concepts.
- STEP 3 Review existing industry certification programs and recommend changes to incorporate FY&N concepts.
Responsible Parties: FCES, in cooperation with local governments, WCRWSA and SWFWMD

SW-1**COST:**

Step 1 is being implemented with existing funding, but additional funding could enable the development of point-of-purchase displays and cover costs for reprinting materials. Additional funding may be required to implement steps 2-3.

Developers/Property Managers

- STEP 1 Promote the development of Model Florida Yards at model home developments in each county and at annual Parade of Homes events. Work with homebuilders' associations and realtors to identify appropriate new housing developments to enlist.
Responsible parties: FCES, with support from local governments
- STEP 2 Develop interpretive signage (including recognition of sponsors) and a promotional brochure that includes a comparison of the costs to develop and maintain a Florida Yard vs. a conventional, maintenance-intensive landscape (see SWFWMD Xeriscape Model Ordinance for reference).
Responsible parties: FCES
- STEP 3 Encourage realtors and property managers to adopt and promote FY&N concepts by providing educational workshops and opportunities to earn Continuing Education Units (CEUs).
Responsible parties: FCES

COST:

Costs to develop a Model Florida Yard at a residential development are estimated at \$5,000, based on plant material, irrigation and interpretive signage. Plants and irrigation costs would be borne by developers, with interpretive signage and consulting provided by FCES. Costs for interpretive signage to promote Model Florida Yards could range from \$500-\$1,000 per site. Funding sources include participating developers, local governments, river basin boards, county realtors' boards and builders' associations.

SW-1

ACTION PLAN

Water & Sediment Quality

SCHEDULE:

FY&N programs are ongoing. Other steps may be initiated in 1997, if FCES is able to secure additional funding from local governments or other cooperating partners.

EXPECTED BENEFITS:

Reduction in fertilizer, pesticide and water use will reduce pollution in runoff to the bay. The increased use of native plants and other beneficial drought-tolerant vegetation in yards is also expected to improve the quality and availability of wildlife habitat.

MONITORING ENVIRONMENTAL RESPONSE:

FCES surveys participants to assess landscape management changes as a result of the program. Public interest in FY&N also can be gauged by tracking distribution of materials and sales at major retail outlets promoting these concepts, number of professionals certified in FY&N concepts, and number of certified Florida Yards.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

SW-2, SW-3, SW-8

Assist Businesses in Implementing Best Management Practices to Reduce Stormwater Pollution, and Develop Model Landscaping Guidelines for Commercial Use

SW-2

ACTION:

Encourage and assist businesses in implementing best management practices to reduce pollution in runoff, and develop model landscaping guidelines for commercial use.

BACKGROUND:

Local communities offer various levels of assistance to businesses in assessing site management practices and developing pollution prevention strategies. These programs can benefit businesses by identifying opportunities for cost-savings, such as reducing a company's expenditures for fertilizer and pesticides used in landscape maintenance. Pollution prevention programs also benefit local government sponsors, who might otherwise be forced to rely exclusively on costlier stormwater treatment.

One example is Hillsborough County's Operation BayWorks - Businesses for a Cleaner Future, established in 1993 with a small grant from the Tampa Bay NEP. The program enlists and aids businesses in the construction, manufacturing, landscaping and automotive repair industries in the development of pollution prevention plans. Participants learn industry-specific best management practices to reduce pollution associated with landscape management, construction equipment and repair, and hazardous materials use and disposal. Specialty businesses such as auto repair shops are a key target because their collective contribution to pollution in runoff can be substantial. These smaller businesses typically lack knowledge about their potential impact on the environment, as well as the resources to research best management practices on their own.

Local communities are encouraged to evaluate programs such as Operation BayWorks as a model for regional implementation to reduce stormwater pollution from commercial sites. Efforts such as these may help local governments meet federal mandates for pollution prevention as required in National Pollutant Discharge Elimination System (NPDES) stormwater permits.

The Tampa Bay NEP also recommends the development of model landscaping guidelines for incorporation into local government landscape ordinance codes. These guidelines could then become incorporated into the site review process for new development and promoted throughout the development community.

Commercial landscapes often feature large areas of high-maintenance turf grass and exotic plants that demand a steady stream of fertilizer, pesticides and water. Stormwater pollution from commercial sites can be reduced with changes in maintenance practices and landscape design, such as downsizing turf areas and expanding the use of water-thrifty and pest-resistant plants.

SW-2

ACTION PLAN

Water & Sediment Quality

Improvements in landscaping practices are just one important part of an overall strategy to reduce pollution from commercial sites. Another strategy, discussed in Action SW-4, is to reduce the amount of impervious surface associated with large developments by lowering parking space requirements in building codes and promoting alternative pervious materials for overflow parking.

STRATEGY:

STEP 1 Target and assist businesses in implementing site management practices to reduce stormwater pollution. Evaluate Hillsborough County's Operation BayWorks as a model for regional implementation.

A comprehensive program might focus on best management practices for landscaping and landscape maintenance, erosion control, and hazardous materials use and disposal. Workplans may include: business workshops; industry-specific workbooks that promote best management practices and include templates for self-assessment and site management plans; model commercial landscape demonstration sites; follow-up surveys or on-site visits to track progress; regulatory incentives; and recognition through existing environmental awards programs and on-site promotional materials or emblems that participating businesses can display.

- A. Identify and prioritize local target industries and businesses.
- B. Form a business steering committee or utilize an existing structure such as environmental committees of local chambers of commerce to oversee development of the program and materials, with representation from local target industries, environmental agencies and the Florida Cooperative Extension Service (FCES). Materials developed for Operation BayWorks may be modified for these purposes.
- C. Implement program and monitor results.
Responsible parties: local governments, in cooperation with chambers of commerce, private industry councils and local government small quantity generators (SQG) programs, which focus on hazardous waste prevention and remediation

STEP 2 Develop a model landscaping ordinance for adoption throughout the region. The guidelines should be succinct, user-friendly and include a comparison of costs to develop and maintain traditional landscapes vs. a model Florida landscape based on FY&N principles (see SW-1).

Responsible parties: local governments, in cooperation with FCES, Southwest Florida Water Management District, West Coast Regional Water Supply Authority

STEP 3 Incorporate model landscape guidelines into local government site review process for new development or, alternatively, provide incentives such as reductions in stormwater utility fees to developers who agree to meet these heightened environmental landscaping standards.

Responsible parties: local governments

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STEP 4 Incorporate Steps 1-3 into NPDES stormwater permits, as examples of efforts to meet federal mandates for pollution prevention.

Responsible parties: local governments

STEP 5 Aggressively promote model landscape design guidelines and maintenance practices throughout the development, business and real estate community, emphasizing cost-savings and environmental benefits.

Responsible parties: local governments, chambers of commerce and private industry councils, Florida Association of Environmental Professionals, builders associations, Florida Native Plant Society

SW-2**SCHEDULE:**

All steps can be initiated in 1997.

COST:

Second-year implementation costs for Operation BayWorks are estimated at \$20,000, plus administrative time. Costs to develop a model landscape ordinance, including landscape cost-comparison analysis, are estimated at \$20,000.

EXPECTED BENEFITS:

Improved landscaping and site management practices and implementation of model landscaping guidelines will reduce pollution in stormwater runoff from commercial sites.

MONITORING ENVIRONMENTAL RESPONSE:

Surveys can be used to track pre-and post-business progress in implementing best management practices to reduce stormwater pollution. Local governments also can gauge business participation by the number of pollution prevention plans developed as a direct result of their outreach.

Stormwater sampling also can be employed to monitor pre-and post-water quality at large commercial sites that agree to implement model landscaping guidelines.

REGULATORY NEEDS:

Dependent upon work plan, but may include amendments to local comprehensive plans, landscape ordinances, criteria for commercial site permitting review, and changes to NPDES permits.

RELATED ACTIONS:

SW-1, SW-3, SW-4

Encourage Local Governments to Adopt Integrated Pest Management Policies and Implement Environmentally Beneficial Landscaping Practices

ACTION:

Encourage local governments to adopt integrated pest management policies and use environmentally beneficial landscaping practices on public properties to reduce pollution from stormwater runoff. As part of this effort, communities are encouraged to commit a minimum of 50 percent of all new public landscapes and retrofits to existing landscapes to low-maintenance designs featuring native or drought-tolerant plants appropriate to the site.

BACKGROUND:

Local government facilities and parks are visited frequently by the public, providing an excellent opportunity to expose residents to environmentally sensitive concepts for landscape design and maintenance.

Many communities already have begun to develop some public sites in accordance with Xeriscape™ principles. For instance, Hillsborough County, in cooperation with the Tampa Audubon Society, is landscaping the planters at its main county office building in Tampa with native plants. However, as new landscapes are planned or as existing landscapes are retrofitted, local governments have an opportunity to further reduce runoff pollution and lead by example, serving as models to citizens who are being asked to conserve water and limit pesticide and fertilizer use.

Changes to comprehensive plans and landscape codes continue to reflect environmental impact concerns, but additional steps can help achieve a broad-based impact within a local government's sphere of influence. Additionally, such efforts can be referenced in the required annual reports for National Pollutant Discharge Elimination System (NPDES) permits, which call for increased pollution prevention.

This action seeks a commitment from local governments to devote at least half of the acreage of all new public landscapes or retrofits to existing landscapes to low-maintenance designs featuring site-appropriate native or drought-tolerant vegetation. It also calls on local governments to adopt resolutions to use Integrated Pest Management (IPM), least-toxic landscape maintenance practices that reduce pesticide use.

Furthermore, information about environmental landscape management (ELM) concepts taught by county cooperative extension services should be communicated regularly to government employees involved in landscape maintenance or the purchase of

fertilizers, pesticides and plant materials. Annual training sessions with those employees could provide updates on new products and techniques that relate to ELM. Sessions of this type also serve to reinforce the commitment made by elected officials and senior staff to environmental quality and pollution prevention.

Hillsborough County is currently revising its landscape ordinance and may incorporate this action.

SW-3**STRATEGY:**

STEP 1 Commit a minimum of 50 percent of all new public landscapes and retrofits to existing landscapes to low-maintenance designs featuring site-appropriate native or drought-tolerant plants, with allowances for areas where turf grass is necessary for recreational use or land application of treated wastewater.

Responsible parties: local governments

STEP 2 Adopt a resolution to use Integrated Pest Management (IPM) on all publicly owned lands, including parks and government facilities. IPM employs biological, cultural and chemical techniques to control pests, and promotes the selective use of pesticides.

Responsible parties: local governments

A model resolution, based on Sarasota County's IPM Policy, has been developed by the Sarasota County Cooperative Extension Service.

STEP 3 Review purchasing specifications for fertilizer and pesticides to assure government use of least-toxic pesticides and slow-release fertilizers as well as cleaning products and other substances and equipment that may be used in site maintenance.

Responsible parties: local governments, in cooperation with county cooperative extension services

STEP 4 Establish annual training sessions for landscape maintenance and purchasing personnel to assure proper use of ELM concepts, BMPs and least-harmful products. Coordinate with the county cooperative extension services to determine if continuing education credits can be provided for approved training.

Responsible parties: local governments

STEP 5 Identify and develop interpretive signage for a minimum of three high-traffic sites where native plants and Florida Yard design and maintenance concepts can be promoted as an attractive alternative to turf grass and exotic plants. Government-owned facilities that resemble residential sites, such as a license tag or utility office, may make ideal candidates for demonstrating how eco-landscaping techniques can be utilized by homeowners.

Also, distribute materials, such as the Florida Yards & Neighborhoods brochure and Florida YardStick, available through the Cooperative

SW-3

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Extension Service, at these sites. Provide incentives, such as plant giveaways and free design consultations, whenever possible.

Responsible parties: local governments

See also Action SW-2 regarding development of model landscaping guidelines, based on Florida Yards & Neighborhoods principles, for incorporation into local government landscape codes.

SCHEDULE:

All steps can be initiated in 1997.

COST:

Steps 1-4 can be implemented with existing resources. Implementation of IPM and other landscaping best management practices may result in cost savings to governments. Costs to develop model landscapes (Step 5) will vary according to site size and specifications. For example, plant materials and signage for a 7,200-square-foot site could be installed for about \$5,000.

EXPECTED BENEFITS:

Improvements in landscaping and landscape maintenance will reduce stormwater pollution, conserve water and enhance native habitat. The establishment of environmental landscapes at public locations will provide homeowners with an "in-ground" demonstration of these methods.

MONITORING ENVIRONMENTAL RESPONSE:

Local governments monitor water quality. They also can track the amount of consumable materials used to maintain public landscapes to quantify reductions and possible cost-savings.

REGULATORY NEEDS:

Possible revisions to Local Government Comprehensive Plans and landscape codes.

RELATED ACTIONS:

SW-1, SW-2

Reduce Impervious Paved Surfaces

ACTION:

Reduce impervious surfaces in the watershed to reduce stormwater runoff and associated pollution by allowing more water to filter through the soil.

SW-4

BACKGROUND:

Like all growing metropolitan areas, the Tampa Bay region contains large amounts of impervious surfaces that increase stormwater runoff and associated surface water pollution by preventing stormwater from seeping into the ground. The impact may be immediate in a waterfront area, or gradual, through the flow of stormwater drains, ditches, ponds and streams.

Existing regulations complicate the problem. Many development standards require that large amounts of impervious surface be incorporated into projects to support parking. Commercial developments, for example, are often required to have a certain number of parking spaces based on a development's total square footage or anticipated absolute maximum demand. These requirements may over-estimate actual parking needs, which may be better served through a combination of traditional surfaces for main parking lots and pervious surfaces for overflow areas.

The use of pervious materials may also be appropriate for parking lots being enlarged or reconstructed in the urban core. Options include turf block (concrete blocks with holes to allow turf growth and water infiltration), grass and specialized pervious hard-surface materials. The cost-effectiveness of these alternative surfaces will be evaluated as part of this action. Some materials can cost as much as three times the amount of traditional pavement.

STRATEGY:

This action calls for an evaluation of the costs and suitability of pervious surface materials, and promotion of their use where appropriate. It also recommends incentives for developers to incorporate these materials in new developments and redevelopment projects in urban areas closest to hot spots of contamination in the bay.

STEP 1 Using product information supplied by manufacturers and engineering analyses, evaluate the performance and costs of various pervious surface materials and compare them to traditional paving. Provide recommendations to the NEP Management Committee in 1997. Much of this information already is available. The assessment should include:

- costs of materials and parking construction
- liability issues
- life expectancy of materials

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- maintenance costs and considerations

Responsible parties: NEP, in cooperation with builders and contractors associations, chambers of commerce and local governments

STEP 2 Identify target areas in which the use of alternative surface materials should be encouraged, and suggest draft revisions to agency rules regulating stormwater to allow credits for pervious pavement. Provide recommendations to the NEP Management Committee in 1997.

- Establish target boundaries for urban sub-basins near bay hot spots of sediment contamination, and overlay information on the areas where local governments are encouraging redevelopment.
- In other areas of the watershed, identify areas where soils may be conducive to the use of pervious pavement.
- Suggest draft rule revisions, including credits for pervious paving.

Responsible parties: NEP, local governments, Southwest Florida Water Management District (SWFWMD)

STEP 3 Based on results of steps 1 and 2, revise local government and agency regulations to encourage the use of pervious alternatives to traditional paving. Options may include:

- basing parking space requirements on expected demand rather than absolute maximum demand, particularly for large developments such as malls, and commercial developments and multi-family dwellings
- providing tax incentives or credits within new taxing sub-districts for the use of pervious paving.
- increasing the ratio of landscaping to site size to reduce impervious surface.

Responsible parties: local governments, SWFWMD

SCHEDULE:

Step 1 can be initiated in 1997. Steps 2 and 3 can be initiated in 1998, based on the recommendations.

COST:

The assessment of pervious paving options can be accomplished through NEP's annual workplan. The actual costs and cost-effectiveness of these materials will be identified as part of the assessment. Steps 2 and 3 will require administrative and staff time of local governments and SWFWMD. Costs to provide incentives or credits for the replacement of impervious surface have not yet been estimated, but may be offset by

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reduced municipal costs in treating stormwater runoff. Cost considerations will be closely evaluated in developing recommendations.

EXPECTED BENEFITS:

Reductions in the amount of impervious surface in the watershed will reduce pollutants such as heavy metals, oil and grease, and nitrogen in stormwater discharged to the bay from urban areas.

MONITORING ENVIRONMENTAL RESPONSE:

Local governments monitor ambient water and sediment quality in Tampa Bay.

REGULATORY NEEDS:

Possible revisions to local development standards and stormwater regulations.

RELATED ACTIONS:

SW-5, TX-1

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SW-5

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ment for properties being redeveloped, and to allow alternative means to satisfy those requirements when on-site treatment is not feasible.

Responsible parties: local governments and regulatory agencies, especially SWFWMD

SCHEDULE:

Step 1 can be initiated by the NEP in 1997 pending availability of funds. Step 2 can be initiated in 1998 after the Comprehensive Conservation and Management Plan (CCMP) has been adopted and regulatory flexibility is granted to allow developers to use alternative means to meet requirements when on-site treatment is not feasible.

COST:

Funding for Step 1 is provided in the NEP's FY96 Workplan. Implementation of Step 2, if approved, will require local government and staff time, as well as the costs associated with stormwater treatment or alternative options required. In-lieu fees deposited by developers into a "stormwater bank" could help finance implementation of alternative stormwater treatment options, such as development of a regional stormwater facility or additional street sweeping. A cost-benefit evaluation of alternative treatments is being developed as part of an ongoing project referenced in Step 1.

EXPECTED BENEFITS:

Stormwater treatment from older properties and in the urban areas of the watershed helps to reduce pollution in stormwater runoff from heavily impacted areas. Flexibility is built in to assure stormwater treatment while still encouraging redevelopment.

MONITORING ENVIRONMENTAL RESPONSE:

Local governments monitor ambient water and sediment quality.

REGULATORY NEEDS:

Revisions to local development criteria and SWFWMD stormwater permit rule.

RELATED ACTIONS:

SW-2, SW-4, SW-6, TX-1

Promote Compact Urban Development and Redevelopment

SW-6

ACTION:

Convene a conference of local government and regional planners, architects and neighborhood councils to evaluate and recommend actions to more effectively promote compact urban development and redevelopment to minimize urban sprawl and associated environmental impacts.

BACKGROUND:

Suburban growth in the Tampa Bay region and elsewhere has given rise to some inefficient patterns of development that can contribute to increased stormwater pollution and costly infrastructure needs by promoting low-density, single-use development at the expense of fostering compact urban development and redevelopment of previously impacted land.

Most new development today is suburban and characterized by low-density residential and commercial land uses. Single-use land patterns that separate residential development from retail and business sectors are most prevalent. Although commercial uses are usually grouped together in linear corridors flanking major roadways, there are rarely interconnections between sites, increasing the public's dependence on automobiles.

While new developments are subject to various stormwater and land-use regulations, the overall effect of this low-density single-use development is to commit an ever-increasing share of land resources within the watershed to suburban uses that increase impervious surface and ultimately result in more runoff pollution. Low-density development also results in greater distances between sites, resulting in longer and more frequent vehicle use and associated atmospheric pollution. Perhaps most importantly, it limits opportunities for efficient mass transit.

Costs to extend infrastructure (utilities, roads, stormwater systems) into outlying areas are extensive and ultimately borne by the community as a whole. As suburban areas expand, large tracts of urban areas are vacated, abandoned or maintained at less than optimal density, factors which discourage reinvestment and reduce the viability of these inner cores. Existing growth management and concurrency guidelines (primarily related to transportation) often penalize existing urban areas of development, while further promoting development in outlying areas.

STRATEGY:

This strategy is to convene a conference of experts from related fields and neighborhood interests to evaluate existing growth management strategies and recommend environmentally sensitive policies and actions to more effectively promote compact urban development and redevelopment. Recommendations would focus on encourag-

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ing reinvestment and redevelopment of the urban core and the development of mixed-use master-planned communities that cluster uses to conserve land and resources.

- STEP 1** Organize a Future of the Region conference to develop recommendations for promoting compact urban development and redevelopment by focusing on real-life scenarios with practical applications for Tampa Bay area communities. For example, conference participants could be divided into smaller working groups and assigned the theoretical task of "redesigning" an existing urban or suburban neighborhood to address common concerns about these mixed-use areas such as parking, setbacks between commercial and residential uses, traffic flow and open space. Demonstrating that urban or commercial areas can be compatible with residential areas in a well-designed plan will engender discussion about how these concepts can be incorporated into existing growth management strategies and may help to educate the public about these concepts.

Recommendations developed as a result of the conference can then be forwarded to local governments. Participants should propose specific recommendations on ways their suggestions can be implemented by local governments, and identify roadblocks that might prevent implementation.

Additional details about possible concepts that might be considered by the workgroups are found in the January 1996 draft of *Charting the Course*.

The conference should include local government planners and metropolitan planning and transportation organizations, as well as the American Planning Association (APA), American Institute of Architects (AIA) and American Society of Landscape Architects (ASLA), councils of neighborhood associations, and environmental/bay interests.

Responsible parties: Tampa Bay Regional Planning Council (TBRPC) to sponsor and organize conference, in partnership with metropolitan planning organizations (MPOs) and local governments.

- STEP 2** Implement recommendations from Step 1 through local government comprehensive plans, development codes and long-range transportation plans.

Responsible parties: local governments, TBRPC

SCHEDULE:

The conference can be planned in 1997, for implementation in early 1998.

COST:

Staff and administrative time is anticipated for implementation of these steps.

EXPECTED BENEFITS:

Redevelopment of existing areas and higher density and mixed-use development in suburban areas will conserve land and water resources, limit urban sprawl and reduce pollution.

MONITORING ENVIRONMENTAL RESPONSE:

Local governments conduct water quality monitoring and periodic planning studies that can gauge the net benefit from implementation of these policies.

REGULATORY NEEDS:

Possible amendments to Local Government Comprehensive Plans, land development and zoning codes, and MPO plans.

RELATED ACTIONS:

SW-4, SW-5

SW-6

Enforce and Require the Timely Completion of the Consent Orders for the Cleanup of Fertilizer Facilities in the East Bay Sector

ACTION:

Enforce and require the timely completion of conditions in the consent orders entered into by CF Industries, CSX Transportation, EAT Terminals, IMC-Agrico and Pakhoed Dry Bulk for the cleanup of wastewater entering the East Bay sector.

BACKGROUND:

In 1990, the Florida Department of Environmental Protection (FDEP) and the Environmental Protection Commission (EPC) of Hillsborough County discovered that five fertilizer shipping facilities in the East Bay area were discharging high levels of nutrients into the bay. A subsequent investigation determined that stormwater was mixing with fertilizer product from these facilities and that the wastewater discharges were not meeting current water quality standards.

Following lengthy negotiations, the five facilities entered into joint consent orders with FDEP and EPC in late 1991. The consent orders included requirements for regular sampling of storm-induced discharges, assessments of wastewater flows and concentrations at the facilities, and sediment sampling at the facilities and at adjacent loading docks. Upon completion of the assessment phase, each facility was to construct or implement the best management practices (BMPs) to manage its nutrient-enriched stormwater discharges.

While all five facilities have begun complying with the terms of their consent orders, progress has varied widely. Some facilities continue to fall short of required water quality standards, and deadlines for completion of site improvements remain undetermined.

IMC-Agrico has completed construction of a detention/treatment facility and is routinely monitoring its outfall, effectively completing the terms of its consent order.

CF Industries is also in its final phase, having completed its assessment, and has applied for a permit to construct a detention facility that would contain a 25-year/24-hour storm event.

Of the five facilities, CSX Transportation is believed to discharge the largest amount of nutrients to the bay. CSX has submitted a permit application and preliminary design plans to construct a retention and treatment system capable of containing a 25-year/24-hour storm event.

The adjacent EAT Terminal has installed pollution control equipment and is now testing its adequacy.

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Pakhoed Dry Bulk, the smallest of the facilities, is implementing BMPs to reduce the amount of fertilizer product entering stormwater. These improvements include outside conveyer belts, truck load-out areas and roofing improvements at storage warehouses. Additionally, the company has submitted a permit application and design plans to retain the first inch of rainfall at the facility.

SW-7**STRATEGY:**

STEP 1 Enforce and require the timely completion of the consent orders.

- A. Continue to require implementation of BMPs and the construction of systems to detain and treat storm-induced discharges, and develop criteria to determine "compliance."
- B. Set deadlines for the final completion of the terms of the consent orders.
- C. Bring facilities into full compliance so they may enter a wastewater permitting and monitoring mode.

Responsible Parties: FDEP and EPC, in cooperation with the five facilities

SCHEDULE:

Step 1-A is ongoing. All facilities should be in full compliance within 12 months of completing construction of treatment systems.

COST:

Costs to implement BMPs at these sites vary according to design and magnitude, and are borne by the facilities under the consent order.

EXPECTED BENEFITS:

Reduced nutrient loadings to the already nutrient-enriched East Bay sector of Tampa Bay.

MONITORING ENVIRONMENTAL RESPONSE:

Individual facilities will monitor outfalls. Ambient bay water and sediment quality is monitored by EPC and other local governments.

REGULATORY NEEDS:

No further regulatory needs are anticipated.

RELATED ACTIONS:

N/A

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- STEP 3 Hold workshops and provide instructional materials in the correct use of fertigation systems. Contact local suppliers of fertigation systems and urge them to provide detailed guidance and support in use of the systems.
Responsible parties: local Cooperative Extension Service offices
- STEP 4 Explore possible cost-sharing programs, such as low-interest loans and grants, to provide financial assistance for the utilization of BMPs, especially for the dairy industry. For example, a fund might be established from nitrogen trading credits and administered through the Florida Farm Bureau. Ensure that the funding assistance available is sufficient to warrant participation by growers.
Responsible parties: NRCS, U.S. Department of Agriculture, Florida Department of Agriculture and Consumer Services, Agricultural Stabilization and Conservation Service, and local soil and water conservation districts

SCHEDULE:

Steps 1 and 2 can be accomplished in 1997. Steps 3 and 4 can be initiated in 1997, with a cost-sharing program identified or established in 1998.

COST:

Steps 1, 2 and 3 involve administrative costs. Costs for Step 4 have not yet been identified. Representative costs for a fertigation system are estimated at about \$700 (for mixing and nurse tank), plus installation at \$1,000 an acre. This estimate includes both the cost of the micro-irrigation system and fertigation components.

EXPECTED BENEFITS:

Use of fertigation systems is expected to reduce the amount of nitrogen entering the bay in agricultural runoff. Research being conducted by the Hillsborough County Engineering Services Department in cooperation with local growers may help quantify the benefits of fertigation vs. conventional fertilization practices. Farmers installing fertigation systems can monitor and report fertilization application rates, using fertigation systems to compare to baseline applications without these systems in place.

MONITORING ENVIRONMENTAL RESPONSE:

Ambient water quality in surface waters receiving runoff from agricultural lands is monitored by local governments and will be reported in a biennial Bay Environmental Monitoring Report.

REGULATORY NEEDS:

Revision to SWFWMD guidelines for AGSWMP to encourage fertigation systems where feasible and where micro-irrigation already is in use.

RELATED ACTIONS:

SW-9, TX-4

Improve Compliance with Agricultural Ground and Surface Water Management Plans

SW-9

ACTION:

Improve compliance with Agricultural Ground and Surface Water Management plans to reduce nutrient and pesticide runoff to the bay.

BACKGROUND:

Florida statutes exempt certain agricultural activities from surface water permitting requirements designed to minimize impacts to wetlands, flooding and water quality. However, confusion about or misinterpretation of the exemptions has led to agricultural activities which may have adverse environmental impacts.

In an effort to ensure that surface water degradation is minimized or eliminated, the Southwest Florida Water Management District (SWFWMD) and the Natural Resource Conservation Service (NRCS), formerly the Soil Conservation Service, have developed a voluntary program that assists farmers in protecting water resources. The Agricultural Ground and Surface Water Management Program, or AGSWMP, educates farmers about exemptions and helps farmers develop water management plans that often enable them to qualify for a permit exemption.

A matrix of best management practices (BMPs) has been developed for the program, listing each BMP and its potential benefits. Using this matrix, NRCS specialists inspect an agricultural operation and evaluate which BMPs are suitable. A plan is developed and the farmer is asked to implement its recommendations, providing a faster, non-regulatory avenue for compliance with surface water rules.

Since the program's creation in 1991, surface water management plans have been developed for more than 3,000 acres of farmland in Hillsborough and Manatee counties. While these efforts are impressive, the percentage of agricultural lands managed under these plans remains small in comparison to the farmed acreage in the region. Hillsborough and Manatee counties, for example, had more than 112,000 acres devoted to citrus, vegetables, or some other form of intensive agriculture in 1990.

Compliance also has been a lingering problem with the program. Once the plan is approved, few if any follow-up inspections are conducted to ensure that farm operators have implemented the plans. Lack of sufficient staff to handle these responsibilities has been identified as a major reason for the lack of follow-up.

The AGSWM program provides a streamlined, less cumbersome approach for growers to comply with the intent of SWFWMD's wetlands and water quality protection rules. But without a reasonable effort to check on the implementation of the AGSWM plans, the effectiveness of the program cannot be determined.

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STRATEGY:

The strategy for this action involves one regulatory action to monitor compliance with AGSWM plans and one voluntary action to encourage greater participation in the program.

- STEP 1** When SWFWMD visits a farm in conjunction with a water use renewal permit, it can use that occasion to check compliance with the farm's AGSWM plan. The site visit made at the time of water use permit renewal provides a convenient time to verify that an existing AGSWM plan is being implemented as agreed to by the grower.

If the inspection shows that a farming operation is not in compliance with the approved AGSWM plan, SWFWMD could allow a grace period in which to comply. Failure to comply within the grace period could be grounds to nullify the permit exemption and require a formal Environmental Resource Permit.

Responsible parties: SWFWMD, NRCS, with assistance in promoting compliance from the U.S. Environmental Protection Agency's (EPA) Pesticides Section

- STEP 2** Recruit growers in Hillsborough and Manatee counties who have successfully implemented AGSWM plans to showcase the results of their efforts to other growers who qualify for the AGSWM program.

Responsible parties: SWFWMD, NRCS, local extension services

SCHEDULE:

Both steps could be implemented in 1997.

COST:

Both steps could be accomplished with existing resources.

EXPECTED BENEFITS:

More widespread participation in and compliance with the AGSWM program will reduce agricultural runoff and wetland impacts, improving water quality in the bay.

MONITORING ENVIRONMENTAL RESPONSE:

Ambient surface water quality and sediment monitoring will be conducted as part of the biennial Bay Environmental Monitoring Report.

REGULATORY NEEDS:

Existing SWFWMD surface water management rules would allow the agency to link renewal of water use permits to compliance with AGSWM plans.

RELATED ACTIONS:

SW-8, TX-4

ATMOSPHERIC DEPOSITION

Scientists searching for the causes of bay pollution have only recently turned their attention to the skies. What they've found has led to a major revision in the bay's pollution portrait.

Studies by the NEP estimate that about 29 percent of the bay's total nitrogen burden falls directly to the surface of the water from the atmosphere. That figure is probably much higher if pollutants falling in the watershed are considered, since a portion of these will eventually enter the bay in stormwater runoff. About 1,100 tons of nitrogen fall on the open bay each year; another 6,600 tons are estimated to fall in the watershed.¹

Air pollution also transports significant quantities of potentially toxic contaminants to the bay, including heavy metals such as cadmium, copper, lead and zinc, which are primarily industrial in origin, although vehicle emissions are also a source. For example, experts estimate that about 44 percent of the bay's annual cadmium loading of more than 7,000 pounds comes from the air. Airborne emissions of cadmium are associated with oil- and coal-fired utilities and waste incinerators.² Polycyclic aromatic hydrocarbons (PAHs) associated with the combustion of fossil fuels and other organic compounds also enter the bay from the air, although specific sources are unknown.

While experts have estimated the amount of atmospheric deposition, they still can't pinpoint how much of the nitrogen in emissions generated locally end up in Tampa Bay — or what impact distant emissions have on the bay. They do know that stationary sources such as coal-fired power plants and garbage incinerators contribute about 70 percent of the nitrogen oxides (NOx) released locally. Mobile sources such as cars and boats account for the other 30 percent.³ Fertilizer plants, which use ammonia in manufacturing their product, also release nitrogen to the air. Wastewater treatment plants may be another source of gaseous ammonia.

Nitrogen is a common element that appears naturally in the environment. Part of the challenge facing researchers is identifying how much of the bay's nitrogen loadings come from natural sources, such as lightning, trees or natural wetland discharges.

The largest single source of NOx emissions in the region is Tampa Electric Company, whose Big Bend and Gannon plants together emitted about 88,000 tons of NOx in 1994. In fact, these two facilities are the first and third largest NOx emitters in Florida, according to a report from the Florida Department of Environmental Protection (FDEP).⁴ Eight of the 10 boilers at these facilities are older "Group 2" units that have no NOx controls in place.

The Tampa Bay NEP supports proposed rules under the Clean Air Act which would require improvements to the Group 2 boilers at these and other facilities in the region, resulting in substantial reductions in NOx emissions — and other important air quality benefits. EPA's final rule governing Group 2 boilers is expected in December 1996. Ozone is also a pollutant of concern in the Tampa Bay airshed. From 1980 to 1995,

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the Tampa Bay area was designated as a non-attainment zone for ozone because the region periodically exceeded federal health standards for this pollutant. In addition to the health risks, the region's non-attainment status also restricted economic growth. Ensuing controls focused on reducing industrial and vehicular emissions of volatile organic compounds or VOCs, a precursor of ozone. Subsequent improvements led to the area's reclassification in 1996 as attaining National Ambient Air Quality Standards for ozone.

As part of its request for re-designation, local communities and the FDEP developed a maintenance plan to preserve the area's attainment status for a minimum of 10 years. The plan includes regular tracking for total airborne emissions of VOCs and NO_x, which must remain level or decrease in order to prevent additional analysis and regulatory action. Action might include limitations on stationary or mobile sources of NO_x which, unlike VOCs, have not previously been subject to control.

Atmospheric deposition to Tampa Bay is expected to increase as population, power consumption and traffic grows, although increases may be mitigated in part by Clean Air Act provisions, which require utilities and motor vehicles to reduce emissions. Local communities ultimately should be held accountable only for that portion of atmospheric deposition which comes from local sources. Coordination at the regional and national levels will be necessary to assure broad implementation and enforcement of pollution controls. Pollution prevention through energy conservation also must be emphasized.

Research will continue to be a priority in the effort to understand and address atmospheric deposition. This effort received a boost in 1995 when the Tampa Bay NEP was selected to participate in the U.S. Environmental Protection Agency's (EPA) Great Waters Program, which focuses on atmospheric deposition and its effects on water quality. In cooperation with local communities, this program is sponsoring a three-year Tampa Bay Atmospheric Deposition Study to investigate where the atmospheric deposition is coming from and how large a role it plays in stormwater pollution.

As part of this initiative, the Environmental Protection Commission (EPC) of Hillsborough County has established an air sampling station at its Gandy Boulevard monitoring site to collect daily wet deposition samples and weekly dryfall samples with assistance from Pinellas County. The 18-month study, funded by NEP and EPA, began in August 1996. Results of the investigation will help quantify the amount of atmospheric nitrogen entering the bay and provide additional clues to researchers investigating the sources of the pollution.

SUMMARY OF ACTIONS FOR ATMOSPHERIC DEPOSITION

- AD-1 Continue atmospheric deposition studies and develop an action plan to address this important environmental issue.
- AD-2 Promote public and business energy conservation.

References, Atmospheric Deposition:

- 1 Estimates of Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loadings to Tampa Bay, Florida. Technical Appendix: 1992-1994, Total Nitrogen Loadings to Tampa Bay, Florida. TBNEP Technical Publication #19-96. (1996)
- 2 Chemical Contaminants in the Tampa Bay Estuary: A Summary of Distributions and Inputs. TBNEP Technical Publication #01-95. (1995)
- 3 Florida Department of Environmental Protection. 1994. Air Quality Report, 1994.
- 4 Ibid.

CHARTING
the **COURSE**

FOR TAMPA BAY**AD**

Continue Atmospheric Deposition Studies and Develop An Action Plan to Address this Important Environmental Issue

ACTION:

Continue to investigate the sources and effects of atmospheric deposition, and develop an action plan to address the issue.

BACKGROUND:

The Tampa Bay National Estuary Program estimates that about 29 percent of the bay's total nitrogen loadings are directly deposited to the bay from the air. Atmospheric deposition also contributes significant quantities of toxic substances to the bay, including heavy metals and polychlorinated biphenyls (PCBs).^{1,2}

While specific sources of atmospheric deposition have not yet been identified, emissions inventories suggest that power plants and vehicles are major contributors. The largest single source of NO_x emissions in the region is Tampa Electric Company, whose Gannon and Big Bend facilities emitted a total of 88,000 tons of nitrogen oxides, or NO_x, in 1994.³ Annual NO_x emissions from all stationary sources in Hillsborough and Pinellas Counties exceeds 100,000 tons.⁴

Mobile sources such as cars and boats release an additional 45,000 tons of NO_x into the air each year in the tri-county area.⁵ But experts still don't know how much nitrogen from the emissions enters Tampa Bay, or what percentage of stormwater pollution entering the bay actually comes from the air.

The initial action plan for addressing atmospheric deposition relies heavily on research. U.S. Environmental Protection Agency's (EPA) selection in 1995 of the Tampa Bay NEP to participate in the Great Waters Program brought federal attention and funding to this effort. A task force comprised of researchers from EPA and representatives from local governments, agencies and utilities has been established to oversee the Tampa Bay Atmospheric Deposition Study. The detailed study plan includes research to identify sources, nutrients and toxic emissions in atmospheric deposition, as well as the impact of atmospheric deposition on stormwater runoff to the bay.

In 1996, the Environmental Protection Commission (EPC) of Hillsborough County and Pinellas County began an intensive air sampling study with funding from the NEP. Results of that effort will help quantify the amount of nitrogen entering the bay and provide additional clues to researchers investigating the sources of the pollution. Also in 1996, EPA's research vessel, the OSV Anderson, was deployed to Tampa Bay for a two-week tour to measure ammonia over the bay. That investigation revealed concentrations of gaseous ammonia in the East Bay sector of Hillsborough Bay that were more than 15 times higher than other stations monitored in Tampa Bay.⁶ Researchers are now investigating the sources of that ammonia and its relative impact on bay water quality.

STRATEGY:

STEP 1 Implement the Tampa Bay Atmospheric Deposition Study, which is expected to require three to four years for completion. The study will investigate:

- the relative contribution to atmospheric deposition from local and remote sources;
- the importance of ammonia to the total nitrogen input budget for Tampa Bay;
- the distribution of nitrogen deposition in the watershed;
- the contribution of dryfall to local atmospheric deposition;
- the contribution to stormwater runoff from atmospheric deposition in the watershed.

Staff from the Tampa Bay NEP and Florida Department of Environmental Protection's (FDEP) Air Quality Division will coordinate the study's first phase. Additional studies may be needed to identify specific sources of atmospheric deposition.

Responsible parties: *Tampa Bay NEP, in association with the Atmospheric Deposition Task Force*

STEP 2 Based on findings, develop an action plan that includes cost-benefit analyses of options to reduce atmospheric deposition. Options could include voluntary reductions in emissions; additional regulation or other requirements of power plants or motor vehicles; pollution prevention programs; reductions in the incineration of toxic materials through recycling; and revisions to federal, state and local rules.

A preliminary draft of this action plan will be prepared by the Tampa Bay NEP in cooperation with the Task Force by October 1998.

Responsible parties: *Tampa Bay NEP and EPA, in cooperation with the Atmospheric Deposition Task Force*

SCHEDULE:

Step 1 was initiated in 1995. Intensive sampling studies began in August 1996. A draft action plan to address atmospheric deposition to Tampa Bay will be prepared for Management Conference review in October 1998.

COST:

Costs for research associated with the Tampa Bay Atmospheric Deposition Study are estimated to range from \$200,000-\$500,000. More than \$400,000 has already been allocated by the NEP and EPA for this project. Other possible funding sources include the EPA Great Waters Program; EPA/FDEP 319(h) grant funds; Florida Pollution Recovery Trust Fund; Southwest Florida Water Management District's Surface Water Improvement & Management (SWFWMD-SWIM) program; Florida Department of Transportation; local government air programs; local utilities; Electric Power

AD-1

AD-1

ACTION PLAN

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Research Institute; and air emission permit or permit violation fees.

While action plans have not yet been developed, the following comparison illustrates the costs associated with reducing a ton of NOx from both power plants and motor vehicles.

Estimated costs to retrofit power plant "wet bottom" or "cyclone" (Group 2) boilers, which are used by some local facilities, range from a median of \$73 per ton of NOx removal from emission for wall-fired/wet bottom boilers up to \$635 per ton for cyclone furnace/wet bottom boilers.⁷ Assuming (only for purposes of comparison) that 100 tons of NOx translates into 1 ton of nitrogen entering the bay (as estimated in Chesapeake Bay studies), the costs to reduce 1 ton of nitrogen deposition to the bay range from \$7,300 to \$63,500. The four largest units in the region (TECO's Gannon 5-6 and Big Bend 1-2) are wall-fired units which may be able to reduce nitrogen deposition to the bay for less than \$10,000 per ton.

By comparison, EPA estimates that the cost of NOx control through vehicle inspection and maintenance programs to be about \$1,000 per ton of NOx removed from the air, or an estimated \$100,000 per ton of nitrogen deposition.⁸

EXPECTED BENEFITS:

Research will enable bay managers to allocate responsibility for the bay's cleanup and direct resources to areas of greatest need. Local air, water and sediment quality are all expected to benefit from actions to reduce or cap NOx and toxic emissions.

MONITORING ENVIRONMENTAL RESPONSE:

Atmospheric deposition monitoring began in 1996 and will continue throughout the duration of the three-year study. Long-term monitoring needs have not yet been determined.

REGULATORY NEEDS:

Regulatory changes may be called for in the action plan that is developed

RELATED ACTIONS:

AD-2

References, Atmospheric Deposition:

- * The Task Force for the Tampa Bay Atmospheric Deposition Study is comprised of representatives from EPA Region IV and the Great Waters Program; the Tampa Bay National Estuary Program; local government air, water quality and transportation departments; local utilities, and the state departments of transportation and environmental protection.
- 1 Estimates of Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loadings to Tampa Bay, Florida, Technical Appendix. TBNEP Technical Publication #19-96 (1996).
- 2 Chemical Contaminants in the Tampa Bay Estuary: A Summary of Distributions and Inputs, TBNEP Technical Publication #01-95 (1995).
- 3 Attainment/Maintenance Plan for the Tampa Bay Florida Ozone Non-attainment Area, Environmental Protection Commission of Hillsborough County and Pinellas County Board of County Commissioners (1994).
- 4 Florida Department of Environmental Protection. 1994. Air Quality Report, 1994.
- 5 Ibid.
- 6 Preliminary data report for the July Tampa Bay ammonia project in 1996. Prepared by Pai-Yei Whung for Tampa Bay Atmospheric Deposition Study. (1996)
- 7 EPA Federal Register Vol. 61, No. 13, January 19, 1996.
- 8 D. Brezenski, EPA, personal communication to Tom Rogers, FDER, 1996.

AD-1

Promote Business and Public Energy Conservation

AD-2

ACTION:

Promote business energy conservation through participation in the U.S. Environmental Protection Agency's (EPA) Green Lights and Energy Stars programs. Continue to promote public energy conservation.

BACKGROUND:

Atmospheric deposition from stationary and mobile sources contributes nearly one-third of the bay's total nitrogen loading. Power plants are a major source of these emissions, and energy conservation can help to reduce demand on these facilities while saving customers money on their utility bills.

Local utilities already promote energy conservation to residents and businesses through incentives such as rebates for energy-smart heat pumps and free energy audits. These programs should be continued, and ratepayer literature developed for distribution with customer billings that discusses the link between energy use, air pollution and bay water quality, since that connection isn't readily made by most residents.

Of particular interest are businesses that are heavy energy users. Voluntary programs that help businesses reduce energy consumption are appealing because they prevent pollution, are non-regulatory and decrease overhead costs. The EPA sponsors three such programs: Green Lights, which targets light-intensive businesses such as hospitals and shopping malls; Energy Star Buildings, which focuses on a holistic approach to building efficiency; and Energy Star Office Equipment, which addresses energy-intensive computers, copiers, monitors, fax machines and printers.

Lighting accounts for 20-25 percent of all electricity sold in the United States—and lighting for industries, stores, offices and warehouses represents 80-90 percent of total lighting electricity use, so the use of energy-efficient lighting has a direct effect on pollution prevention. Every kilowatt-hour of lighting electricity not used prevents emissions of 0.7 kilograms of carbon dioxide (CO₂), 5.8 grams of sulfur dioxide (SO₂) and 2.5 grams of nitrogen oxides (NO_x), which are of particular concern in Tampa Bay. Energy Stars' participants further increase bottom-line business and environmental paybacks by addressing additional energy-demanding features within their facilities such as heating and cooling. Implementation of Energy Star programs may also reduce other pollutants associated with coal- or oil-fired power plants, such as mercury, a pollutant of concern for Tampa Bay.

Cox Newspapers, a Green Lights participant and owner of the *Atlanta Journal and Constitution*, estimates its annual savings at more than \$55,000 since upgrading its lighting. The company reduced its total annual electricity and its lighting electricity usage by more than 1.2 million kilowatt hours and 63 percent per kilowatt hour respectively at a 350,000-square-foot facility. These energy savings translated into a reduction of 1.6 million pounds of CO₂, 7.6 million grams of SO₂ and 2.7 million grams of NO_x per year.

Nationally, more than 1,800 businesses participate in Green Lights and Energy Stars, including approximately a dozen partners in the Tampa Bay region. This action calls for targeting an additional 100 businesses, and expanding cross-marketing opportunities through environmental agencies and local governments. For example, local governments promoting best management practices to reduce stormwater pollution through programs, such as Hillsborough County's Operation BayWorks and Adopt-A-Pond, can also promote business participation in Green Lights and Energy Stars to increase bottom-line benefits for participants and the environment.

AD-2**STRATEGY:**

- STEP 1** Develop and provide EPA with a target list of 100 light- and equipment-intensive businesses in the watershed, including hospitals and newspapers, for possible participation in the program. Also investigate possible reductions in exterior lighting if energy reductions can be made without compromising public safety.

Responsible parties: Tampa Bay NEP, in cooperation with local electric utilities, local government air quality and road departments, the Florida Department of Transportation (FDOT) and chambers of commerce.

- STEP 2** Sponsor a biennial workshop with EPA in the Tampa Bay Area, in partnership with other organizations.

Responsible parties: Tampa Bay NEP, local utilities, EPA

- STEP 3** Promote Green Lights and Energy Stars through local chambers of commerce, business associations and downtown partnerships, and seek their endorsements and commitments to promote these initiatives.

Responsible parties: Tampa Bay NEP, Agency on Bay Management (ABM), local utilities

- STEP 4** Encourage municipalities to promote energy conservation by requiring energy-efficient lighting and equipment in government buildings or by becoming Green Lights partners.

Responsible parties: local governments

- STEP 5** Increase cross-promotion of Green Lights and Energy Stars by local governments and environmental agencies in their contacts with businesses, and incorporate Green Lights concepts into their programs where applicable.

Responsible parties: local government stormwater and environmental management departments

- STEP 6** Encourage utilities to include information in customer billing newsletters about the link between energy usage and bay water quality and the benefits of energy conservation.

Responsible parties: Tampa Bay NEP, utilities and ABM

AD-2

ACTION PLAN

Water & Sediment Quality

SCHEDULE:

Target lists should be completed by September 1997 for 1998 workshops. All other steps can be initiated in 1997.

COST:

Staff time is involved in all steps. Business partners can expect cost savings associated with reduced energy use as a result of implementation.

EXPECTED BENEFITS:

Energy conservation will result in reduced emissions from power plants and atmospheric deposition to the bay.

MONITORING ENVIRONMENTAL RESPONSE:

Local participation in these EPA programs and associated pollutant reductions will provide a yardstick for measuring the success of this initiative. A study is underway to measure atmospheric deposition to Tampa Bay.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

AD-1

WASTEWATER

Reclaiming treated wastewater for commercial and residential uses represents one of the most promising opportunities for reducing nitrogen loadings to Tampa Bay and conserving precious water supplies in the future. St. Petersburg's pioneering effort in reuse in the 1970s, which drastically reduced the city's direct discharges to the bay from its four treatment plants, paved the way for many of the projects now planned and underway. The City of Tampa is currently exploring ways to reclaim up to 50 million gallons of wastewater it now discharges daily to Hillsborough Bay, to relieve pressure on the region's potable water supplies.

But evaluations of reclaimed water projects must consider the net effect to the bay and its tributaries when large discharges are withdrawn. For instance, declines in nutrient loadings that may pollute the bay must be weighed against the impact of redirecting a freshwater source from the bay if that fresh water serves an important ecological role.

Once a pervasive problem for the bay, point-source pollution has declined substantially with improved regulation and advances in treatment technologies. In fact, the retooling of Tampa's Howard F. Curren wastewater treatment plant at Hookers Point in 1979 is widely regarded as a chief catalyst in the bay's water quality recovery. Advanced wastewater treatment technologies employed there and at other upgraded facilities can curb up to 90 percent of the nitrogen from treated wastewater discharges.

Direct or "point" discharges of wastewater to Tampa Bay from municipal sewage treatment plants and industries now contribute about 14 percent of total bay nitrogen loadings, roughly one-third of the amount contributed from "non-point" sources represented in stormwater runoff. These regulated point sources also contribute roughly 30 percent of the bay's total loadings of arsenic, cadmium, chromium and copper, as well as low levels of other contaminants.

Experts expect continued declines in point source pollution as the use of reclaimed water expands. Because point sources are concentrated and easily identified, they often are among the most cost-effective to treat. The strategy to address wastewater from point sources focuses on expanding the use of reclaimed water where projects are beneficial to the bay; improved treatment of industrial effluent; pollution prevention; and monitoring to improve compliance with discharge permits.

SEPTIC SYSTEMS

In some bay sectors, leachate from septic systems, which serve about 20 percent of the region's populace, may contribute substantially to nitrogen loadings. Preliminary studies by the Southwest Florida Water Management District (SWFWMD) also suggest that a proportionate amount of nitrogen loadings to the bay may come from disposal of septic waste and sewage treatment plant sludge containing nitrogen and heavy metals.

Septic systems located near the bay pose the greatest potential threat to water quality, particularly along creeks where flushing is limited and the water table is near the ground surface.

WW



ACTION PLAN

Water & Sediment Quality

SUMMARY OF ACTIONS FOR WASTEWATER

- WW-1 Expand the use of reclaimed water where reuse benefits the bay.
- WW-2 Extend central sewer service to priority areas around the bay now served by septic systems.
- WW-3 Require standardized monitoring of wastewater discharges.
- WW-4 Revise HRS rules to incorporate environmental performance or design standards for septic systems.

Expand the Use of Reclaimed Water Where Reuse Benefits the Bay

WW-1

ACTION:

Expand and encourage the reuse of highly treated domestic and industrial wastewater where reuse produces a net benefit for Tampa Bay.

BACKGROUND:

St. Petersburg's pioneering efforts in wastewater reuse for residential irrigation in the late 1970s were at the forefront of a technological movement that would offer both substantial benefits and some important challenges⁹ to a region anxious to conserve its freshwater supplies, and at the same time, save the bay from an overly rich diet of nutrients discharged in wastewater.

Today, projects to reclaim wastewater for irrigation and other applications are underway in all three counties bordering the bay. Local governments now reuse roughly 40 million gallons of treated wastewater per day, mostly for urban and agricultural irrigation, but also for industrial purposes. Projects planned or underway in local communities will more than triple that amount (see reuse table).

The Wilson-Grizzle Bill, which called for advanced technology to limit pollutants discharged to the bay from domestic wastewater facilities, was a driving force behind these early efforts and a lifeline for a polluted bay. The legislation prompted the City of Tampa in 1979 to upgrade its wastewater treatment plant at Hookers Point, a change that helped bring about sweeping improvements in the bay's water quality. At the same time, St. Petersburg was launching its reclaimed water project, which eliminated most of its direct wastewater discharges to the bay. The Wilson-Grizzle legislation was eventually repealed but a subsequent Grizzle-Figg bill reinstated the requirements for advanced wastewater treatment.

The potential benefits of reuse to the bay and to a water-thirsty region are substantial. Reuse already has helped to reduce annual nitrogen loadings to the bay and will play a key role in the strategy to reduce future nitrogen loadings — although reuse does not completely eliminate nitrogen loadings since some portion will eventually enter the bay in stormwater runoff. It is also widely recognized as a cost-effective, long-term alternative source of water for irrigation and commercial applications and potentially for potable needs. Reuse is a key element of the Southwest Florida Water Management District's (SWFWMD) New Water Source Initiative, a strategic blueprint designed to reduce the area's dependence on groundwater and protect the Floridan Aquifer from saltwater intrusion. SWFWMD's regional basin boards also have been instrumental in providing cooperative funding for innovative reuse programs.

Nevertheless, projects to reclaim wastewater should be evaluated carefully to determine their net impact to the bay and to address various public health and logistical concerns. The City of Tampa is now proposing a project to reclaim as much as 50 million gallons of the treated wastewater it discharges daily to Hillsborough Bay from its

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Howard F. Curren facility at Hookers Point. Discharges from this facility now represent about 7 percent of the total freshwater inflow to Hillsborough Bay during the dry months of the year.

While the bay will benefit from the reduction in nutrients to this heavily impacted sector of the bay, a part of this load may be rerouted to the Tampa Bypass Canal, mixed with canal water, and then pumped to the Hillsborough Reservoir. Additionally, Hillsborough Bay will lose a portion of its freshwater inflow. A planning and environmental impact assessment for this project began in late 1995.

STRATEGY:

This strategy is to evaluate and recommend implementation of reclaimed water projects that result in a net benefit to Tampa Bay.

- STEP 1** Evaluate the environmental impacts of the major reuse projects planned for the Tampa Bay region, including the net effects of reducing or eliminating the discharge (changes in salinity and pollutant loadings) and any corresponding impacts to rivers and reservoirs. (See related action FI-1). Evaluations also should adequately address the project's ability to satisfy any public health concerns or perceptions stemming from the use of reclaimed water. Any environmental impacts associated with reuse projects should be balanced against the public need for cost-effective water supply alternatives.

The Tampa Bay National Estuary Program recommends implementation of those reuse projects that benefit the bay.

Responsible parties: local governments, SWFWMD, Florida Department of Environmental Protection (FDEP), West Coast Regional Water Supply Authority (WCRWSA), Florida Game and Fresh Water Fish Commission (FGFWFC)

- STEP 2** If current municipal and industrial reuse expansion plans coupled with other efforts to reduce pollution are insufficient to meet long-term goals for nitrogen management in the bay, investigate additional opportunities to expand reuse by interconnecting distribution systems or constructing larger storage facilities.

Responsible parties: local governments, SWFWMD, WCRWSA, in cooperation with the Tampa Bay NEP

SCHEDULE:

The status of major reuse projects that are planned or underway is provided in Table 1. Evaluation of the City of Tampa project to reclaim treated wastewater currently discharged to Hillsborough Bay began in 1995.

COST:

Estimated costs and funding sources for major projects are provided in Table 1. Information was provided by wastewater reuse coordinators, utility officials and environmental planners associated with these projects.

EXPECTED BENEFITS:

Reuse projects have the potential to substantially reduce long-term nitrogen loadings to Tampa Bay, and also help to conserve the region's water supplies. Both the amount of water conserved through a project and the anticipated reduction in nitrogen loadings are presented in Table 1. However, major projects should be balanced against any potential drawbacks for the bay or public health concerns associated with reuse.

MONITORING ENVIRONMENTAL RESPONSE:

Ambient water quality is monitored by local governments. Local government and industrial applicants for reuse permits also will be required to conduct water quality monitoring as a condition of the permit.

REGULATORY NEEDS:

FDEP regulations governing water reuse (FAC 62-610) are currently being revised to allow the use of reclaimed water to rehydrate wetlands within wellfields under specific conditions. A draft of the proposed rule changes is expected by late 1996. However, additional amendments may be needed to allow uses where there is a net environmental benefit for the bay. The issue of "ownership" of reclaimed water and control over how that water can be used also should be clarified.

RELATED ACTIONS:

FI-1, WQ-1

WW-1

Table 1. Summary of major projected or funded domestic wastewater reuse projects in the Tampa Bay region

Local Government	Plant/Project	Total Reuse Vol. (mgd)	Cost (in millions)	Funding Source	TN reduction (tons/yr)	Project Status
Hillsborough County	NW Service Area: 1) River Oaks, NW Reg. WWTP - Service to residential and commercial uses and golf courses, and connection to Dale Mabry/Van Dyke WWTP- 2) Dale Mabry/Van Dyke WWTP - extend service to an additional 1,550 residences	15.0	15.0 44.0	County CIP, SWFWMD RWIU*	34.5	9-phase county project to be completed by the year 2000, as part of 5-year CIP*. Distribution to individual residences is part of 20-year plan with expected completion in 2015.
	Central Service Area: 1) Connect Valrico & Faulkenburg WWTPs; extend service to golf courses and residential areas; construct storage facilities; inter-connect with raw water line to Cargill plant.	16.0	10.0 15.0	County CIP, user fees, SWFWMD RWIU	36.5	WWTP connection lines and storage facilities in design phase. Construction part of 5-year CIP with expected completion in 2000.
	South Service Area: 1) South County Reg./ Summerfield WWTP - Extend service area and hook up additional homes	6.5	3.3	County CIP, user fees	14.8	Part of 20-year plan, with expected completion in 2015.
Tampa	Howard Curran WWTP - AWT effluent to Hillsborough River Reservoir or Tampa Bypass Canal, to augment potable water supply	50.0	100	User fees, SWFWMD, State, bonds	137.0	Begin design in 1996. Projected to be on-line in 2000.
Plant City	Effluent to CF Industries, agricultural users	8.0	14.0	Plant City Util. board, SWFWMD (Gov. board & Hills. River Basin Board)	18.3	Pending; expected to be on-line by 1998-1999.
Pinellas County	North Plant - extend service to 500 additional homes (if flow available)	9.0	NA	NA	20.6	Underway; expected completion by 1998-1999. This represents the county's maximum reuse capacity.
	McKay Creek & South Cross Bayou -WWTP upgrade, transmission main, infill lines	23.0	23.0 phase 1 60.0 phase 2	User fees, bonds, CIP, SWFWMD, State	52.5	
St. Petersburg	NE, SE, SW, Albert Whitted Plants - expand overall distribution network, adding 5000 additional homes	4.2	20.0	User fees, SWFWMD	11.4	Expected completion by 2005.

Table 1. Summary of major projected or funded domestic wastewater reuse projects in the Tampa Bay region (continued)

Local Government	Plant/Project	Total Reuse Vol. (mgd)	Cost (in millions)	Funding Source	TN reduction (tons/yr)	Project Status
Clearwater	No new reuse projects are planned					
Safety Harbor	No new reuse projects are planned					
Oldsmar	City to treat East Lake Woodlands wastewater, return to golf courses	0.3	4.5	User fees, SWFWMD	0.68	Expected completion by 1997.
Largo	Increase reuse from 6 to 12 mgd	6.0	8.0	User fees, SWFWMD	13.7	Expected completion by 2000.
Manatee County	Network SW, SE, and N Plants - expand distribution to county residences and homes in west Bradenton, and east to agricultural areas (MARS*)	17.2	50.0	Federal grant, 50/50 SWFWMD	39.3	Expected completion by 1999.
Bradenton	AWT Discharge to augment Braden River flow	6.0	3.5	User fees, bonds, SWFWMD	13.7	Feasibility study initiated; timetable not projected for implementation.
Palmetto	1) Distribution main to Frog Creek area (agriculture), in cooperation with Manatee Co. (MARS)	1) 0.9	1) 3.5	User fees, CIP funds, SWFWMD funds, County funds	2.74	Will reuse 90% of their effluent by 2000.
	2) Distribution system to city parks, golf course, schools	2) 0.3	2) 1.1			
Polk County	no new reuse projects are planned					
Lakeland	no new reuse projects are planned					

* RWIU - Reclaimed Water Improvement Unit. Similar to special taxing district, used to fund reuse water systems within county subdivisions.

CIP - Capital Improvement Plan

MARS - Manatee Agricultural Reuse System

Calculation of TN reduction is based on the difference between TN load from direct surface discharge to the bay from WWTPs and TN load associated with wastewater reuse.

Extend Central Sewer Service to Priority Areas Now Served by Septic Systems

ACTION:

Extend central sewer service to high-density areas along the bay and its tributaries where water quality problems associated with residential and commercial septic systems have been documented.

BACKGROUND:

Preliminary studies conducted for the Southwest Florida Water Management District (SWFWMD) suggest that leachate from septic tank drainfields may contribute about 5 percent of the bay's total annual nitrogen loadings and significantly more in localized areas. Malfunctioning septic systems can also contribute bacteria and viruses (pathogens) associated with fecal coliform in human waste to surface waters. Ground water carries nitrogen from septic tank drainfields to surface waters. Septic systems located closest to the bay and its tributaries pose a particular concern.

There are nearly 100,000 septic systems in the Tampa Bay watershed. Areas that demand close scrutiny for water quality impacts from these systems include creeks where flushing is limited and the water table is close to the surface of the land, and other nearshore areas of the watershed with high densities of mostly older systems. Among these are Allen's Creek in Pinellas County, several creeks and the Ruskin inlet near the mouth of the Little Manatee River, and Tampa's McKay Bay.

Elevated levels of fecal coliform and nitrogen have been reported in many of these and other areas around the bay. But only a few site-specific studies have been conducted to directly link septic systems to these impacts, which may also be due to natural causes or animal waste carried in stormwater runoff. Nevertheless, the sandy soils in Southwest Florida are not highly suitable for septic systems, and preliminary studies point to the potential for nitrogen impacts in some areas.

This action calls for further investigations at suspected problem sites to document the impact from septic systems, along with efforts to extend central sewer service to areas where problems are identified. Areas with septic systems installed prior to 1983 and nearshore areas with high densities of septic systems should be evaluated first.

Conversion from septic to central sewer service can be costly, with residential hook-up fees ranging anywhere from \$2,000 to \$5,000 or more. This underscores the need to investigate financing options such as interest-free loans and cost-share grants or partnerships to assist residents in areas slated for central sewer service. Additionally, the availability of central sewer service may encourage higher-density development in these environmentally sensitive areas, and local governments should take this into consideration in their long-range planning programs.

STRATEGY:

- STEP 1** Identify areas adjacent to the bay and its tributaries where residential and commercial septic systems are suspected of causing water quality impacts. Areas with septic systems installed prior to 1983, when siting criteria was established, should be given high-priority status.

Responsible parties: local governments, public health departments

- STEP 2** Analyze worst-case scenarios for nitrogen loadings from septic systems based on their proximity to the creek or surface water. Where necessary and cost-effective, install meters and wells to monitor groundwater seepage into the creeks or affected areas. A remote sensing technique employed by the Tennessee Valley Authority to detect areawide drainfield failures may be a useful monitoring tool.

Responsible parties: local governments, Florida Department of Environmental Protection (FDEP), public health departments

- STEP 3** Based on results from steps 1 and 2, extend central sewer service to coastal areas where water quality problems have been documented, except where legal or budgetary constraints exist.

Responsible parties: local governments

- STEP 4** Distribute educational brochures promoting best management practices (BMPs) for septic tanks (see Pinellas County brochures developed for the Allen's Creek watershed).

Responsible parties: local government

- STEP 5** Evaluate the use and effectiveness of fecal coliform as an indicator of public health concerns.

Responsible parties: Tampa Bay NEP

- STEP 6** For new or existing developments where central sewer service is available or feasible, develop and implement a local regulation to require its utilization. Where central sewer service is not feasible, determine the most environmentally beneficial means to provide sewage treatment.

Responsible parties: local governments

SCHEDULE:

Local governments can begin implementation of Steps 1 and 2 in 1997. Implementation of Step 3 will depend on results from analyses and cost and financing factors. Step 4 will be initiated as funding becomes available. Step 5 can be pursued in 1997. Conversion from septic to central sewer service is already underway in some areas as part of existing capital improvement plans.

COST:

Costs to analyze water quality in suspected problem areas may be upwards of \$2,000, based on 10 samples at \$200 each. Sampling for viruses or other pathogens, if deemed necessary, would increase those costs. Monitoring of wells and seepage meters is esti-

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mated at \$125-\$250 per station. Funding options for residents converting to central sewer service must be developed to make implementation affordable and feasible.

EXPECTED BENEFITS:

Efforts to convert high-density coastal areas served by septic systems to central sewer service will help to reduce nitrogen and pathogen levels in the bay and bay tributaries, making these areas safer for swimming and other watersports. Additionally, improved conditions may allow for the re-classification of restricted shellfish harvesting areas.

MONITORING ENVIRONMENTAL RESPONSE:

Nutrient loadings from on-site septic systems traditionally have been hard to quantify, however monitoring and modeling called for in this action will assist in this effort.

REGULATORY NEEDS:

Revisions to local government comprehensive plans and the development of implementing ordinances.

RELATED ACTIONS:

WW-4, PH-3

Require Standardized Monitoring of Wastewater Discharges

WW-3

ACTION:

Require standardized monitoring of wastewater discharges from industrial and municipal facilities, and improve regulatory and public access to permit compliance monitoring data.

BACKGROUND:

Improvements in the monitoring and reporting standards governing industrial and municipal facilities discharging wastewater to Tampa Bay will improve the accuracy of information used to develop bay water quality models and pollution control standards — efforts that will lead to improved environmental oversight. Inadequacies in the existing system prevent effective trends analysis and limit the public's and regulatory community's ability to effectively monitor discharges.

Standardized units of measurement for wastewater concentrations and flows are necessary to calculate wastewater loadings to the bay. Municipal wastewater treatment facilities currently are required to report standardized flow measurements, but some industrial point sources are not. Furthermore, requirements to report the concentration of nutrients or other contaminants in wastewater vary considerably.

Efforts also are needed to improve local government, agency and public access to data collected from these facilities. Most computerized permit compliance data is available only through the Tallahassee or District offices of the Florida Department of Environmental Protection (FDEP), and often requires extensive time and effort for retrieval.

This action calls for the standardized reporting of a core group of parameters from all point-source facilities discharging more than 100,000 gallons per day, and improved access to monitoring data collected from these facilities.

STRATEGY:

STEP 1 Require the measurement and reporting of a core group of parameters from all point-source facilities in the Tampa Bay watershed with National Pollutant Discharge Elimination System (NPDES) permits discharging an average daily flow of more than 100,000 gallons of wastewater.

The core group should include concentrations of total nitrogen, total phosphorus, total suspended solids, total ammonia, and average daily or monthly flow (actual discharges, not values estimated in permits). These core parameters are in addition to any permit-specific reporting that may be required. An exemption may be allowed for parameters which that facility is not reasonably expected to discharge. Revisions to existing permit criteria should be added as permits are renewed, pending an evaluation of additional costs associated with additional sampling requirements.

Responsible party: FDEP, local governments

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- STEP 2** Enforce the use of standard reporting units for the core group of parameters, including flow rate. Nutrient concentrations are required as milligrams per liter (mg/l); flow is reported as average daily flow or monthly flow (mgd or mgm).

Responsible party: FDEP (for permitting), applicable point-source facilities (for standardized monitoring and reporting)

- STEP 3** Monitor the centralized data entry process instituted in 1996 by the FDEP to ensure timely updating of permit files within 30 days from the time a compliance report is submitted.

Responsible party: Tampa Bay NEP

- STEP 4** Improve access to the FDEP computerized database for permit compliance at the regional level through District offices. Currently, FDEP's Southwest District and the Environmental Protection Commission (EPC) of Hillsborough County have access to the main data base, but other interested parties must request data retrievals from FDEP District or Tallahassee staff. They must either go to the District office to review the information, or have it mailed to them. Access to this database should be available in a more timely fashion through the Internet or on disk.

Responsible party: FDEP Tallahassee and District offices

SCHEDULE:

All steps can be initiated in 1997.

COST:

Staff time is associated with efforts to improve and provide more timely access to the compliance monitoring database. Administrative costs also will be incurred if rule revisions are needed to mandate additional sampling of core parameters. The costs incurred by point-source facilities to comply with standardized sampling and monitoring criteria should be evaluated.

EXPECTED BENEFITS:

Improved monitoring standards will improve the data used to develop bay water quality models that are the basis for many of the most significant management actions for the bay.

MONITORING ENVIRONMENTAL RESPONSE:

Results will be measured in improved data quality and accessibility.

REGULATORY NEEDS:

Revisions to FDEP Rules 62-4 or 62-620 may be necessary to include measuring and reporting standards for a core group of parameters in each NPDES permit.

RELATED ACTIONS:

WW-2

Revise HRS Rules to Incorporate Environmental Performance or Design Standards for Septic Systems

WW-4

ACTION:

Revise the rules of the Department of Health and Rehabilitative Services (HRS) governing septic system siting and monitoring to incorporate environmental performance or design standards that protect the bay and further assure public health and safety.

BACKGROUND:

Preliminary studies conducted for the Southwest Florida Water Management District (SWFWMD) indicate that as much as 5 percent of the bay's total nitrogen loadings may come from the nearly 100,000 septic systems in the Tampa Bay watershed.

The Florida Department of HRS currently oversees and approves the siting and monitoring of all on-site sewage treatment systems with a capacity of 10,000 gallons per day or less, including septic and other on-site disposal systems. Although Florida's septic system permitting criteria (Florida Administrative Code [FAC], Chapter 10D-6) are more stringent than most other states, regulations focus mainly on public health interests and do not include potential impacts from water pollution except those that relate to bacteria and viruses and the contamination of public drinking water supplies.

A January 1995 revision allows HRS to consider impacts to ground and surface waters from septic systems, but leaves the basic siting and design standards essentially unchanged. For example, the rule does not contain effluent quality standards pertaining to nutrients that leach from septic systems to ground water and surface water, except in the Florida Keys. Proposed maintenance schedules are included, but they are advisory only.

Furthermore, septic systems constructed prior to the establishment of the current design criteria may continue to operate — even in high-density areas where their presence may aggravate local water quality problems — as long as the load to them does not change substantially.

This action is to develop environmental performance or design standards for the design and siting of septic systems and to incorporate these guidelines into HRS regulatory guidelines. This process should begin with a determination of the allowable concentrations or loadings of nitrogen and pathogens to surface waters. Environmental performance standards could then be established to require a minimum level of nitrogen removal from on-site disposal systems. However, since these criteria may be difficult to establish and enforce, officials may opt to develop design and operating standards that would help to prevent nitrogen contamination of ground or surface waters from septic tanks. Design standards could include stricter setbacks from surface waters, minimum wet-season water table depths, soil permeability and content, and recommended maintenance intervals. At sites where performance standards cannot be

ACTION PLAN

met, local governments may require on-site disposal systems with nitrogen-removal capability.

Regular and timely maintenance of existing septic systems also is important, and could negate the need for more stringent design criteria. The cost of pumping out a septic system is about \$250. Although health officials recommend that septic systems be pumped out at least every three years, many residents postpone maintenance until a problem is apparent. Thus, this action also seeks to better educate residents about the link between septic systems and potential water quality problems, and promote regular maintenance of these systems.

Finally, this action calls for the development of a statewide septage and sludge disposal tracking system to more effectively monitor handling and disposal practices and associated impacts. Monitoring sewage sludge is an important problem, particularly in the Hillsborough and Manatee river basins, because of the number of permitted disposal sites. Different agencies regulate disposal sites and it is difficult to determine how much material is being spread and how it is handled.

STRATEGY:

STEP 1 Conduct a workshop to develop environmental performance or design standards for septic systems. Participants should include the U.S. Environmental Protection Agency (EPA), HRS, Florida Department of Environmental Protection (FDEP), local health departments and the Florida National Estuary Programs. Workshop participants should also explore the feasibility and availability of cost-sharing programs to assist homeowners in retrofitting or replacing existing septic systems in areas with documented water quality problems.

Responsible parties: Tampa Bay NEP, FDEP, HRS, local governments

STEP 2 Evaluate whether the environmental design criteria should be implemented through a statewide rule change or local ordinances.

Responsible parties: HRS, local governments

STEP 3 Determine and promote the minimum schedule for septic system maintenance based on environmental standards in cooperation with private companies that provide pump-out services. Residents also could be encouraged to perform routine inspections and maintenance of septic systems by including reminders and educational materials in local utility or water bills.

Additionally, require that septic systems be pumped out at time of property transfer, or that the property owner provide documentation that the system has been pumped out within the previous three years.

Responsible parties: local governments with assistance from local health departments in implementing property transfer criteria

STEP 4 Develop a statewide septage and sewage sludge tracking and monitoring program to improve oversight of material handling and disposal.

Responsible parties: FDEP and HRS

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Water & Sediment Quality

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SCHEDULE:

All steps can be initiated in 1997.

COST:

Administrative costs and staff time only are anticipated in this action, but the environmental standards that are developed may require additional resources for environmental protection. If a statewide rule revision is deemed necessary, HRS and legal staff time to revise the current rule is estimated at \$50,000.

WW-4

EXPECTED BENEFITS:

The establishment of environmental performance or design standards for septic systems will help reduce nitrogen loadings to the bay and prevent future siting of septic systems in areas vulnerable to water quality impacts.

MONITORING ENVIRONMENTAL RESPONSE:

Ambient water quality is monitored by local governments.

REGULATORY NEEDS:

Possible revisions to FAC Chapter 10D-6 or local ordinances to incorporate environmental performance or design standards for septic systems.

RELATED ACTIONS:

WW-2, PH-1



TOXIC CONTAMINATION

Stormwater treatment, pollution prevention and improved hazardous waste disposal are key components of the strategy to reduce the amount of toxic contaminants entering the bay.

Recent studies by the National Oceanic & Atmospheric Administration (NOAA) point to contamination of bay sediments at several sites around the bay by heavy metals, pesticides and other substances that at sufficiently high concentrations can be damaging or deadly to marine life.

Sediments from Hillsborough Bay, the bay's most industrialized sector and home to the Port of Tampa, generally revealed the highest levels of contaminants. Concentrations of cadmium, lead and zinc at Hillsborough Bay exceeded Florida's Probable Effects Level (PEL) for toxic contamination, guidelines that predict biological impact to marine life. Pinellas County's Boca Ciega Bay and Bayboro Harbor also ranked among the bay's hot spots of contamination.

Many toxic pollutants enter the bay attached to sediments in stormwater runoff, but atmospheric deposition (associated with industrial and vehicle emissions) and wastewater discharges also contribute significant quantities of contaminants to the bay. Pollutants tend to concentrate around ports, marinas and industrial harbors, as well as major stormwater outfalls.

Overall, toxic parameters in the bay's sediments are in the middle ranges nationally. Among 200 sites studied nationwide, samples of oysters from rural Cockroach Bay ranked third nationally in 1988 in total concentrations of the insecticide chlordane, which was banned that year. Sediments there also revealed high levels of the pesticide DDT, which was banned in the early 1970s, but persists in the marine environment.

To assess overall bay bottom quality, the Tampa Bay NEP will utilize a trio of tests, evaluating sediment chemistry, toxicity, and the health and diversity of bay bottom communities. Results from these analyses will be used to classify areas of the bay that are heavily contaminated, exceeding threshold levels for biological impact, and for which sediment remediation may be considered; those that are polluted but more readily restorable by reducing or maintaining existing pollutant loads; and toxic-free areas that should be protected from contamination. Management actions will vary according to sediment classification, the type of pollutants present and technical feasibility.

Results of a recent risk assessment conducted for the Tampa Bay NEP indicate that some metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides are present at concentrations with a significant potential for causing toxic effects to fish and wildlife, either through direct exposure to the sediments, or indirectly through the food web. The first phase of the study, completed in 1996, evaluated the potential risks to marine organisms and human health from pollutants in Hillsborough and Boca Ciega bays, two of Tampa Bay's most impacted sectors.

The primary contaminants of concern identified in the study include metals (particularly chromium, copper, mercury and nickel); PAHs; PCBs; and chlorinated pesticides. Stormwater runoff and atmospheric deposition transport the vast majority of these pollutants to the bay. Both PCBs and chlorinated pesticides aggressively persist in the marine environment, posing potential hazards long after the use of a particular chemical has been restricted.

Several state advisories have been issued urging limited consumption of Gafftopsail catfish, Crevalle jack, ladyfish, Spanish mackerel and certain shark species in Tampa Bay and other Florida coastal waters based on the total mercury detected in them. The Department of Health and Rehabilitative Services recommends that these fish not be consumed more than once a month by children or women of childbearing age, or more than once a week by other adults.

Mercury in fish flesh appears predominantly as methylmercury which is readily absorbed by the human digestive system. Consumption of excess amounts of methylmercury over a prolonged period of time produces toxicity in the central nervous system. Children are particularly sensitive to mercury. Exposure during pregnancy is known to cause toxic effects in the fetus. The Florida Department of Environmental Protection is sponsoring research into the causes of the mercury problem in Florida and potential control strategies.

The second phase of the NEP risk assessment will focus on Bayboro Harbor and the western edge of Old Tampa Bay near Allen's Creek. These investigations are helping to identify which pollutants pose a continuing threat to the bay and those that represent past or inactive sources of pollution. The findings will be used to develop a more targeted action plan to address toxic contamination in 1997.

Summary of Actions to Address Toxic Contamination

- TX-1 Address hot spots of toxic contamination.
- TX-2 Improve opportunities for proper hazardous waste disposal.
- TX-3 Reduce toxic contaminants from ports and marinas.
- TX-4 Promote integrated pest management on farms to reduce pesticides in runoff.

Toxic contaminants also are addressed in the Action Plans on Atmospheric Deposition, Stormwater Runoff and Wastewater.

Address Hot Spots of Contamination

TX-1

ACTION:

Address hot spots of toxic contamination in the bay's most heavily impacted basins.

BACKGROUND:

A 1996 risks assessment conducted for the NEP in Hillsborough and Boca Ciega bays indicates the presence of some contaminants at concentrations that could pose significant harm to fish and wildlife either through direct contact with the sediments or indirectly through the food web. These contaminants include metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides.

To evaluate the risks associated with sediment contaminants, researchers compared toxicity levels for each contaminant with potential exposures to fish and wildlife. A key aspect of the investigation was to assess toxic effects resulting from bioaccumulation, the tendency for some contaminants to increase in concentration as they travel up the food chain. This poses a greater risk to predators that consume smaller fish and organisms. The study also assessed the potential for human health risks from eating fish caught in Hillsborough and Boca Ciega bays. The second phase of the risk assessment, focusing on Bayboro Harbor and the western coast of Old Tampa Bay, will be finalized in early 1997.

The primary contaminants of concern in Hillsborough and Boca Ciega Bays are metals (chromium, copper, mercury, silver and nickel); PAHs; PCBs; and chlorinated pesticides. Atmospheric deposition and stormwater runoff convey the bulk of these pollutants to the bay. Mercury loadings are linked to atmospheric deposition, while chromium and copper tend to enter the bay in stormwater runoff. A 1995 state health advisory urged Florida residents to limit their consumption of certain fish in Tampa Bay and other coastal waters because they contained elevated levels of mercury.

The top anthropogenic sources of PAHs include air pollution from the combustion of fossil fuels, waste incinerators and open-burning fires, as well as runoff from roadways.

Atmospheric deposition also is considered responsible for the majority of PCBs and chlorinated pesticides entering the bay. PCBs are released in direct discharges from industrial facilities to municipal sewage treatment plants, leachate from waste disposal sites, incineration and the re-use of transformer oil. They also can enter the bay in stormwater runoff when contaminated soils are disturbed, for example, during farming or construction. Both PCBs and chlorinated pesticides are very persistent in sediments and tend to bioaccumulate in organisms.

Chlorinated pesticides of significant concern are DDT, chlordane, endrin, heptachlor epoxide and lindane. Each of these has been banned or heavily restricted due to its potential toxicity to fish and wildlife. Banned in 1972, the insecticide DDT was primarily used on crops, but also employed extensively in ditches, swamps and marshes for mosquito control. Endrin was used as a general pesticide to control insects, rodents

and birds until 1986. Heptachlor was manufactured for use as an insecticide, but has been restricted since 1983 except for use in controlling termites. Lindane has not been produced in the U.S. since 1977. Lindane is less toxic to fish and wildlife and less likely than other chlorinated pesticides to bioaccumulate in animals tissues.

Stormwater treatment is a key strategy in toxics reduction, since many toxic contaminants enter the bay attached to sediments in runoff. The NEP is funding a project in 1997 to identify local and regional stormwater treatment projects that reduce the flow of contaminants to areas of greatest concern.

Best management practices (BMPs) to reduce total suspended solids (TSS) in runoff include retention ponds, vegetated buffer strips, swales and underdrains, as well as non-structural means such as street sweeping or stricter zoning standards to limit development density in sensitive areas. Treatment methods that address large or multi-parcel sites are preferred, since they increase the likelihood of operational success and may offer an added opportunity for habitat creation.

In areas of long-standing sediment contamination, where the source of pollution is no longer active, bay managers may consider the cost-effectiveness of other techniques such as sediment capping or removal.

STRATEGY:

The NEP strategy to address hot spots of contamination is to identify and implement priority stormwater treatment projects, continue efforts to identify specific sources of contamination and source-control strategies, and continue to monitor the bay to assess changes and trends. Atmospheric deposition, which is responsible for a significant amount of toxic contaminants loadings, is addressed in a separate action plan.

STEP 1 Implement local and regional projects identified in the NEP's Priority List of Projects to Address Toxic Contamination, slated for completion in 1997. Projects will emphasize stormwater improvements in heavily contaminated basins, but may also include point-source control or pollution prevention strategies in specific basins.

If stormwater improvements and source-control strategies fail to achieve adequate results, consider options for and feasibility of sediment cleanup or containment.

Responsible parties: *local governments, Florida Department of Environmental Protection (FDEP)*

STEP 2 Continue to monitor sediment chemistry, toxicity and benthic communities to assess changes and trends.

Responsible parties: *local governments*

SCHEDULE:

Step 1 can be initiated in 1997 following completion of the second phase of the risk assessment and identification of priority projects to address toxic contaminants. Step 2 is ongoing.

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COST:

Costs to implement stormwater improvements and other controls depend on the method selected. Possible funding sources include Southwest Florida Water Management District's Surface Water Improvement & Management program (SWFWMD-SWIM) through District basin boards, local government stormwater utilities' operating and maintenance budgets, and permit application fees. Sediment chemistry and benthic monitoring for the bay is estimated to cost \$195,000 per year. The Tampa Bay NEP has developed a computer model to use in selecting the most cost-effective mix of techniques to employ in a given area.

EXPECTED BENEFITS:

Reduced toxic contamination of bay sediments and associated risks to marine life and human health as a result of reduced pollutant loadings and other efforts to contain or restore heavily impacted areas.

MONITORING ENVIRONMENTAL RESPONSE:

Ongoing benthic and sediment chemistry monitoring by local governments, together with monitoring requirements for National Pollutant Discharge Elimination System (NPDES) permits, will be used to assess the effectiveness of management actions to reduce toxic contaminants in the bay. Local monitoring will supplement NOAA studies.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

AD-1, TX-3, SW-4

Improve Opportunities for Proper Hazardous Waste Disposal

TX-2

ACTION:

Improve hazardous waste disposal by small businesses and residents by evaluating opportunities to better serve or educate these markets.

BACKGROUND:

Florida generates about 718,000 tons of regulated hazardous waste each year, including approximately 116,000 tons from the Tampa Bay region. Experts estimate that another 10-20 percent is generated by unregulated sources, including residents and conditionally exempt small quantities generators (CE-SQGs) — businesses that generate less than 100 kilograms (kg), approximately 25 gallons, of hazardous waste per month (or 1 kg of acutely toxic hazardous waste) and whose waste disposal is not strictly regulated.

Households and CE-SQGs are an important source of pollution. Improper handling, storage and disposal of hazardous materials can lead to air, soil, surface water and groundwater contamination, which can directly or indirectly impact the bay and public health and safety. Of key concern are hazardous materials such as paints, pesticides, batteries and other chemicals discarded with trash, and materials released (accidentally or intentionally) on the ground, in storm drains or in sanitary sewer systems. Landfills receiving hazardous waste are not specially equipped to deal with these materials, which are buried in pits.

These materials are often discarded with trash because access to hazardous waste collection facilities in most areas is limited, either by hours of operation or by location. Hillsborough County, for example, operates two household hazardous waste facilities, in Apollo Beach and on Sheldon Road (Town & Country), which are open one week-end per month at alternating sites. But cities such as Tampa and Temple Terrace, and communities such as Brandon, are not served by household hazardous waste collection facilities, although residents may use sites in unincorporated Hillsborough County.

Options for small businesses also are limited, mainly because increasing service to these markets can be costly and complex. In Hillsborough County, CE-SQGs may transport their waste to the County's Orient Road facility on Wednesday mornings, under an arrangement with Universal Waste, which operates the facility. However, there are no real incentives for businesses to use the facility, which assesses a charge for the waste it receives. Pinellas and Manatee counties also provide household hazardous waste collection and attempt to assist small businesses in properly disposing of hazardous wastes.

This action calls for improving community and CE-SQG opportunities for proper hazardous waste disposal by exploring options to better serve and educate these markets,

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Water & Sediment Quality

including whether to establish permanent household hazardous waste collection facilities in major communities not currently served.

STRATEGY:

STEP 1 Organize a task force to evaluate methods to improve opportunities for hazardous waste disposal for small businesses and residents, such as:

- promote “milk run” services, in which haulers arrange to pick up waste from CE-SQGs on days they service municipal landfills;
- evaluate the feasibility of raising occupational license fees to “pre-pay” waste disposal costs, instead of charging for the service later;
- allow CE-SQGs to use household hazardous waste collection facilities;
- provide mobile collection service at central sites several times a year, perhaps in conjunction with large events that draw high attendance;
- expand existing service either by expanding weekend hours of operation, providing recycling “swap shops” — such as the one operated by Pinellas County — or siting additional permanent facilities where demand has been justified;
- encourage broader utilization of existing facilities by increasing promotion, and develop partnerships with major retail stores to promote municipal collection facilities;
- organize neighborhood pick-up days in cooperation with programs such as Adopt-A-Pond, Florida Yards & Neighborhoods and LakeWatch;
- develop partnerships with manufacturers to assist in the collection and recycling of materials such as paint.

Additionally, evaluate ways to reduce consumer demand/consumption of hazardous waste materials by promoting “green” shopping through partnerships with major retailers.

Responsible parties: Florida Department of Environmental Protection (FDEP) and Tampa Bay NEP to organize workshop

The task force should include city and county hazardous waste/solid waste coordinators, FDEP, CE-SQG program coordinators, user groups and the NEP

STEP 2 Encourage the City of Tampa and other unserved communities to evaluate the cost-effectiveness of establishing permanent household hazardous waste collection facilities.

Responsible parties: Local governments, FDEP

STEP 3 Cross-market and aggressively promote pollution prevention programs such as the FDEP's P2 Program and Hillsborough County's Operation BayWorks. The P2 program offers businesses free and confidential on-site assessments to assist them in reducing their waste stream and costs. Operation BayWorks assists target business sectors in developing pollution prevention plans by offering industry-specific best management practices and technical assistance.

- Distribute promotional flyers on the P2 Program (and Operation BayWorks in Hillsborough County) in mailings to/meetings with CE-SQGs.
- Promote these programs through local chambers of commerce and the University of South Florida small business development center, through chamber publications and presentations. Invite chambers to serve as partners in promoting the concept of Businesses for a Cleaner Future by aggressively promoting these services and targeting 100 chamber members for participation/sign-up during a given time period.

Responsible parties: local governments, Hillsborough County Environmental Protection Commission's CE-SQG Program, in cooperation with chambers of commerce, FDEP

STEP 4 Develop summary recommendations from steps 1 to 3 for review by the Community Advisory and Management Committees of the Tampa Bay National Estuary Program.

Responsible parties: Task Force

SCHEDULE:

All steps can be initiated and completed in 1997.

COST:

All steps require staff and administrative time. Implementation costs will vary according to recommendations. Costs to construct and operate a permanent household hazardous waste collection facility vary depending on design and level of service. The Pinellas County facility, built within a Class 1 landfill, cost between \$300,000 to \$400,000 to construct. Potential funding sources include local governments and state agency grants.

EXPECTED BENEFITS:

Improvements in hazardous waste disposal will help to reduce toxic contaminants that enter the bay in stormwater runoff, or through groundwater, wastewater or atmospheric deposition.

TX-2

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MONITORING ENVIRONMENTAL RESPONSE:

Municipal solid waste departments track both the amount of hazardous waste they receive and statistics on usage. These can be evaluated as recommendations are implemented to measure progress. Local governments conduct bay sediment sampling to track the amount and distribution of toxic contaminants in the bay.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

TX-1, TX-3

Reduce Toxic Contaminants from Ports and Marinas

ACTION:

Reduce toxic contaminants from ports and marinas by aggressively promoting voluntary business waste stream assessments and pollution prevention programs.

BACKGROUND:

Studies by the National Oceanic & Atmospheric Administration (NOAA) have revealed relatively high levels of sediment contamination at some sites in Tampa Bay. The most tainted sediments were found in northern Hillsborough Bay near the Port of Tampa, especially in Ybor Channel and adjoining waterways. Other hot spots of contamination include Bayboro Harbor, Boca Ciega Bay and portions of western Middle Tampa Bay.

Toxic contaminants in Tampa Bay tend to concentrate around ports and marinas, industrial harbors and major stormwater outfalls. Shipyards and related port and industrial facilities release toxic substances to the bay mainly in stormwater runoff, but also through industrial wastewater discharges and through the air. Substances may include petroleum products, metals, metal treatment chemicals and anti-fouling paints, and contaminants associated with ship repair and scrap iron stockpiles.

Marinas located at the water's edge also are key sources of pollution. Pollutants associated with marinas and boating include oil and oil-based products discharged to the bay in bilge water and during engine maintenance, boat repair and fueling; paints, lacquers, thinners, strippers and solvents; and sewage, detergents and gray water discharged directly from boats.

This action calls on the Florida Department of Environmental Protection (FDEP) to promote its P2 Program to local ports and marinas. The NEP also urges local government waste management programs to focus more attention on these businesses. P2 provides confidential and free waste stream assessments and recommendations on ways companies can reduce pollution from their facilities. Local governments provide education and outreach through their hazardous waste and small quantities generator (SQG) programs.

Additionally, the NEP recommends that a local workgroup evaluate several of the top regional and national pollution prevention programs targeting marinas and boaters, including materials from Puget Sound and Chesapeake Bay, for possible application in Tampa Bay.

All states are required by recent amendments to the Coastal Zone Reauthorization Act (CZRA) of 1990 to adopt programs to control various sources of coastal non-point pollution. Section 6217 of CZRA includes recommendations on best management practices for marinas and boaters, which will be evaluated as part of the effort to design an effective pollution prevention campaign for Tampa Bay.

TX-3

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STRATEGY:

- STEP 1** Work with local port authorities and FDEP to promote P2 waste stream assessments to port tenants and users. Participants would receive a free on-site assessment followed by a report identifying pollution prevention and cost-saving strategies.

Responsible parties: FDEP P2 Program, in cooperation with the port authorities and the Tampa Bay NEP

- STEP 2** Encourage marinas to request a P2 environmental audit to identify pollution sources and appropriate best management practices. Target the bay's 10 largest marinas for participation and audits by October 1997.

Identify major marinas and yacht clubs in the Tampa Bay area and promote the program through direct mail, telephone follow-up and presentations to marina associations. Seek endorsements and co-promotion through these membership associations and from the Center for Marine Conservation and the Clean Water Trust program of BOAT US.

Responsible parties: FDEP P2 Program, with assistance from local Florida Sea Grant Extension Program, Tampa Bay Watch

- STEP 3** Review model programs that promote environmentally responsible marina and boat maintenance practices — including FDEP's emerging Clean Marina Program — for implementation in the Tampa Bay region. Provide recommendations to the Management Conference of the Tampa Bay NEP by October 1997. Pursue public-private partnerships to maximize promotion and cost-share opportunities.

Responsible parties: Tampa Bay NEP, FDEP, Center for Marine Conservation, Tampa Bay Watch, user groups

- STEP 4** Aggressively promote P2 to the business community and local governments who can also boost local business participation. As part of this effort, evaluate P2's existing marketing plan and business utilization for ways to improve its coverage. Provide recommendations to FDEP by October 1997.

Responsible parties: Tampa Bay NEP, in cooperation with FDEP and local governments

SCHEDULE:

The NEP, Tampa Port Authority and FDEP targeted Tampa port tenants and users in 1996 through a direct mail solicitation. Other ports and marinas will be targeted in 1997. Steps 3 and 4 also will be initiated in 1997.

COST:

P2 assessments are provided free to businesses that request them, and frequently result in cost savings to participants by reducing their use of toxic materials and associated disposal costs. Cost-effective educational programs can be developed by tailoring existing model programs from other regions, and by aggressively pursuing funding partnerships. Financing may be pursued from local governments, educational grants or the West Coast Inland Navigational District.

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EXPECTED BENEFITS:

Waste stream assessments and implementation of best management practices at ports and marinas will reduce pollution to the bay.

MONITORING ENVIRONMENTAL RESPONSE:

Sediment quality monitoring by local governments, and waste stream reports that identify reductions, can assess progress in reducing toxic contamination.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

TX-1, TX-2, PH-3

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TX-3

Promote Integrated Pest Management on Farms to Reduce Pesticides in Runoff

ACTION:

Encourage the use of Integrated Pest Management (IPM) techniques on farms to reduce pesticide residues in the bay from agricultural runoff.

BACKGROUND:

Agriculture is an important component of the bay region's economy, with an estimated value of \$1.3 billion a year. About one-third of all the land in the bay watershed is used for some form of agriculture. Pasture and range lands comprise the majority of that acreage, followed by citrus groves and row crops.

Because Florida's wet, humid climate promotes the growth of weeds, molds and insects that can damage crops, use of pesticides, herbicides and fungicides is greater in Florida than in any other state. These chemicals tend to adhere to fine soil particles that may be carried in runoff to streams, lakes and bays, where they can be assimilated by aquatic animals through the food web, impairing reproduction or growth.

A recent comprehensive study conducted by the National Oceanic and Atmospheric Administration (NOAA) assessed the levels and effects of pesticides in bay sediments. While concentrations of most substances were below levels expected to cause biological harm, the Tampa Bay NEP has identified several pesticides of concern to Tampa Bay: chlordane, dieldrin, DDT, endosulfan, endrin, heptachlor epoxide, lindane and mirex. Of these, only endosulfan is still actively used by farmers in the Tampa Bay watershed, to control whiteflies and other insects on tomatoes. The remainder are banned or severely restricted.

IPM, a program utilizing biological and chemical weapons to efficiently control pests, is a proven method of reducing use of toxic chemicals and minimizing their release to the environment. IPM techniques include examination of crops to identify pest infestations; use of least toxic control materials such as soaps or oils; use of pheromones to disrupt insect reproductive cycles; and release of pest predators such as ladybugs. Many farmers employ "scouts," full-time or contract employees trained to identify and assess the severity of pest problems and recommend solutions based on IPM principles.

Because no requirements currently exist for IPM use, it is not known how many farmers employ IPM practices, although local extension agents report that most farmers use at least some aspects in their pest management programs. Surveys now being conducted by the University of Florida's Institute of Food and Agricultural Sciences (IFAS) will clarify the extent of IPM usage.

Local agricultural extension agents provide educational materials and assistance to farmers who wish to learn about IPM. They incorporate IPM concepts in training seminars that farm operators attend to earn Continuing Education Credits, which can be applied toward the renewal of their pesticide applicator's license. Additionally, IFAS

scientists have prepared brochures describing pesticides least likely to pollute ground or surface water, based on soil types and leaching potential. These “grower’s guides” offer a range of pesticide options for 54 different crops grown in Florida.

However, many farmers are not aware or do not take advantage of these resources. Compounding this problem is the rise in growth of “corporate farming,” in which packing houses own or lease the land and contract with growers to produce the crops. One effect of this has been to shift some of the decision-making from the growers to the packing houses. Hence, packing house managers, as well as growers, may need to be targeted by IPM educational programs.

Because most farm operators obtain pesticide application licenses from the state Department of Agriculture and Consumer Services (FDACS), tying IPM education to the licenses would ensure that farmers are exposed to IPM concepts. The licenses must be renewed every five years, and a farmer can meet the renewal requirements either by passing an exam or taking courses equal to eight Continuing Education Units (CEUs). Requiring that one section of the exam pertain specifically to IPM practices, or that at least one CEU credit be devoted to IPM training, would offer farmers an incentive to learn more about IPM concepts.

The FDACS is coordinating a cooperative task force, composed of experts from the agricultural and scientific sectors, to encourage the proper or limited application of potential harmful pesticides near waterways. Representatives of various chemical companies also serve on this group, which has concentrated its efforts to date in South Florida. This action calls for the Tampa Bay NEP to participate in this effort by sponsoring a meeting of the U.S. Environmental Protection Agency (EPA) task force in the bay region to share information with local farmers and scientists and obtain recommendations on restricting or reducing the use of certain pesticides.

STRATEGY:

- STEP 1** Revise the state pesticide applicator licensing renewal criteria to incorporate in the renewal exam a specific section on IPM. For applicants who choose to earn CEU credits instead of taking the exam, at least one of the credits should encompass IPM training.
Responsible parties: FDACS, IFAS, State Pesticide Coordinator
- STEP 2** Seek increased federal support from the federal government to implement existing IPM educational and application programs.
Responsible parties: Tampa Bay NEP, Agency on Bay Management
- STEP 3** Hold a one-day workshop of the pesticide task force in the bay region and encourage participation by local growers, scientists and environmental managers. The workshop should explore:
- the extent and associated environmental effects of pesticides
 - specific recommendations to reduce or restrict the use of those that

The logo consists of the text "TX-4" in a bold, sans-serif font. To the left of the text is a small, stylized graphic of a sun or a star with rays emanating from it.

ACTION PLAN

Water & Sediment Quality

present a risk to the bay and bay wildlife

Responsible parties: Tampa Bay NEP, FDACS, EPA

STEP 4 Implement the recommendations of the task force (Step 3), preferably through voluntary cooperation by manufacturers and area farmers.

SCHEDULE:

Step 1 could be initiated in 1997 or at the next review of the pesticide license renewal criteria, with the development of new guidelines focusing on knowledge of IPM. Steps 2 and 3 can be initiated in 1997. Recommendations could be implemented in 1998.

COST:

The costs of revising pesticide license renewal criteria need to be determined. Steps 2, 3 and 4 can be accomplished with existing resources.

EXPECTED BENEFITS:

Reduced use of pesticides by area farmers will reduce the risks to birds, fish and other aquatic life in Tampa Bay.

MONITORING ENVIRONMENTAL RESPONSE:

Annual measurements of pesticide concentrations in sediments will be conducted by local governments as part of the benthic monitoring program for Tampa Bay.

REGULATORY NEEDS:

Revisions to the pesticide applicator licensing renewal criteria developed by the Florida Department of Agriculture and Consumer Services.

RELATED ACTIONS:

SW-8, SW-9

PUBLIC HEALTH

PH

Despite recent strides toward bay recovery, many residents still regard the bay as too polluted to swim in, and its fish and shellfish too contaminated to eat. This lingering, and largely incorrect, perception stems from the 1970s, when the piping of raw or partially treated sewage into the bay resulted in algae blooms that decomposed, producing noxious odors, and bacterial contamination made some segments unsafe even for swimming.

Today, state laws require sewage treatment of the highest level, and the bay is beginning to regain its status as a premier recreational resource. However, substantial emergency discharges of raw or partially treated sewage still occur when heavy rains cause stormwater to seep into some municipal sewer systems, and bacterial contamination still results in the occasional closure of bay beaches to swimming and shellfish beds to recreational harvest. Correcting these problems would be a significant step toward maximizing recreational enjoyment of the bay and allaying public fears about its safety.

Both swimming and shellfish harvesting are restricted when heavy rains wash stormwater, with its high bacteria content, into areas where those activities are permitted and monitored. However, decisions about when to close public beaches are usually based on the threat of contamination, and not on actual sampling that detects high levels of coliform bacteria.

Local health agencies around the bay use different criteria to determine when a beach should be closed. No common water quality standards exist for the bay's saltwater beaches — a shortfall that this action plan addresses.

Knowing that the bay's beaches are monitored routinely and comprehensively, and that decisions about closures or restrictions are based upon current scientific evidence of contamination — not merely the potential of pollution based on past problems — is critical to restoring positive public attitudes about the bay and fostering appreciation of its wide-ranging recreational opportunities.

Additionally, public health concerns can be reduced by corrective actions aimed at eliminating accidental or intentional discharges of sewage to the bay during severe storm events. Sewage overflows are of particular concern in St. Petersburg and Pinellas County, where low land elevations, aging collection systems and rapid population growth strain existing municipal sewer systems. As a result of recent emergency discharges of sewage into waterways during heavy rains, St. Petersburg is now under a consent order issued by the Florida Department of Environmental Protection (FDEP) and is working to remedy problems in its collection system. It will be important in future years for all communities to properly manage and maintain their sewer systems to ensure that the substantial water quality gains achieved by improved treatment facilities are not offset by inadequate collection and distribution networks.

ACTION PLAN

Water & Sediment Quality

SUMMARY OF ACTIONS TO ADDRESS PUBLIC HEALTH

- PH-1 Reduce the occurrence of municipal sewer overflows to the bay.
- PH-2 Establish water quality standards for saltwater beaches.
- PH-3 Install additional sewage pump-out facilities for recreational boaters and live-aboard vessels.

Reduce the Occurrence of Municipal Sewer Overflows to the Bay

PH-1

ACTION:

Require local governments to prepare maintenance plans identifying overflow areas within their sewage collection systems, and address those areas in their maintenance program.

BACKGROUND:

Unintentional sewer overflows are a growing problem nationwide, as sewage transport and collection systems age and increasing population growth taxes the capacity of these networks to accommodate increased flows. In the Tampa Bay region, the problem is compounded by low land elevations, high groundwater tables and heavy rains, which can result in vast amounts of stormwater infiltrating sanitary sewer systems, prompting emergency bypasses of treatment plants and direct discharge of raw or partially treated sewage to Tampa Bay.

In August 1995, excessive rains overloaded sanitary sewers in St. Petersburg, causing sewage backups in homes and forcing officials to shunt about 15 million gallons of raw sewage into canals and creeks leading to Tampa Bay. Further investigation revealed that the city had experienced several overflows in the past. St. Petersburg utility officials commissioned intensive studies to determine the extent of the problem and appropriate corrective actions, and the Florida Department of Environmental Protection (FDEP) subsequently initiated an enforcement action against the city. Similar overflow problems have occurred in Pinellas and Hillsborough counties, and environmental officials expect continued problems as existing collection and transport systems age or become inadequate for increased flows due to growth.

St. Petersburg's experience has highlighted the extent of the problem in the bay area, and helped to identify areas in which improvements are needed to ensure adequate notification, investigation and correction of these problems. For instance, current wastewater regulations only address the operation and maintenance of wastewater treatment plants, with no review of collection systems. Although utilities are required to report unpermitted emergency discharges to the FDEP within 24 hours, there is often no way to know what problems exist until an overflow has occurred. Then the utility is often placed in an enforcement mode, and reviewed on a case-by-case basis. Additionally, utilities are often blamed for overflows in systems owned by their wholesale customers — usually smaller communities with no treatment plants of their own — since the wastewater permit is issued to the utility owning and operating the treatment plant.

Recognizing the serious threats posed to water quality and human health by unintentional overflows, the U.S. Environmental Protection Agency (EPA) Region IV office in Atlanta convened an internal working group in early 1996 to discuss ways to improve compliance and enforcement strategies. Among the products being developed

PH-2

ACTION PLAN

Water & Sediment Quality

**Establish Water Quality Standards
for Saltwater Beaches**

ACTION:

Develop local water quality standards for beaches and encourage all counties and cities in the Tampa Bay region to use those standards for monitoring public beaches.

BACKGROUND:

Beach closures resulting from fecal coliform in the water have been a problem in some parts of the bay where swimming is permitted, such as Spa Beach in St. Petersburg and Picnic Island Park in Tampa. The closures are usually a result of poor water quality, as evidenced by the presence of fecal coliform, usually found in small areas in high concentrations after heavy rainstorms.

Sampling of area beaches is typically conducted monthly by local public health units. However, there are no uniform standards for restricting swimming and other water-contact recreation, such as windsurfing, in saline waters. Consequently, bay area communities have applied different standards to determine whether beaches should be temporarily closed, possibly analyzing different parameters and using different sampling techniques. Additionally, new research indicates that fecal coliform may not be an accurate indicator of potential public health problems, since it does not detect viruses or other pathogens that may be present. When more accurate analytical indicators have been fully developed, local governments may want to consider using those as a substitute or in combination with testing for fecal coliform. Consistent standards throughout the region would improve public health protection and maximize recreational use of the bay while helping to identify sources of water quality problems at bay beaches.

STRATEGY:

- Step 1 Review existing standards, parameters and sampling techniques used by local governments and public health units for testing of beach waters. A summary of these standards has been completed as part of a technical study for the Tampa Bay NEP.

Responsible Parties: the state Department of Health and Rehabilitative Services (HRS) is responsible for establishing water quality parameters for public health purposes and should lead this effort, with local coordination provided by the Tampa Bay Regional Planning Council. Local health units and environmental agencies also should participate.

- Step 2 Establish uniform standards, sampling techniques and monitoring schedules for waters near public beaches. The standards should be parameters commonly monitored for public health concerns and should be formally adopt-

ed by each government in the form of a local regulation.

Responsible Parties: HRS, local government health units and environmental management departments

SCHEDULE:

Step 1 can begin in 1997, with standards available for adoption in 1998.

COST:

Only staff time, document preparation and administrative costs are anticipated if fecal coliform is retained as the primary analytical indicator. If new indicators are recommended, additional sampling and testing costs will have to be determined.

EXPECTED BENEFITS:

Increased public health protection and increased knowledge about the status and problems of bay waters.

MONITORING ENVIRONMENTAL RESPONSE:

Using a uniform set of standards and sampling techniques to test beach waters will increase the effectiveness of bay monitoring programs. Sampling can be done more frequently and results can be compared to other portions of the bay, so trends in water quality can be determined and problem areas more readily identified.

REGULATORY NEEDS:

Amendments to local or state regulations will be needed to adopt a uniform standard for marine water quality monitoring.

RELATED ACTIONS:

PH-1, PH-3

PH-2

PH-3

Install Additional Sewage Pump-out Facilities for Recreational Boaters and Live-aboard Vessels

ACTION:

Assist local governments in obtaining assistance through the Florida Clean Vessel Act grant program to construct sewage pump-out facilities at publicly owned marinas bordering Tampa Bay.

BACKGROUND:

In the past, efforts to reduce sewage discharges in Tampa Bay justifiably have focused on improvements to land-based wastewater treatment plants serving one or more municipalities. But with these facilities now operating under strict pollution prevention rules, attention should be shifted to the smaller, yet continual discharges of the thousands of boaters who routinely ply the bay.

There are 214 marinas in the three counties surrounding the bay. Of the 25 that have pump-out facilities, 19 are in Pinellas County, and three each are in Hillsborough and Manatee. Of the two public marinas in the region with pump-out stations, only one, in downtown St. Petersburg, is located directly on the bay. Providing more pump-out facilities would help reduce fecal coliform as well as nitrogen loadings and suspended solids associated with sewage while encouraging boaters to become more responsible stewards of the bay they enjoy.

Pathogens associated with human wastes can severely impact a body of water, leading to restrictions on bathing, swimming and shellfish harvesting. Although the exact effect of sewage discharges from boats on Tampa Bay is not known, studies in other waterways indicate the untreated human wastes of a single boater can be equal to the treated wastes of thousands of people. More than 100,000 boats are registered in the three-county area surrounding Tampa Bay, and many more transient boaters pass through. In addition, an unknown number of live-aboards reside at bay area marinas.

Guidelines proposed by the U.S. Clean Vessel Act call for one pump-out station for every 300- 600 boats. Following those recommendations, Hillsborough County should have 18 pump-outs, Pinellas 25, and Manatee 7. Additionally, a new state law, effective October 1994, prohibits boaters from dumping raw sewage into Florida waters and requires many boats 26 feet or longer to have a working toilet with waste storage on board when in state waters. To aid compliance, the state is offering grants for the next five years to assist marinas in adding or improving pump-out facilities. The grants, administered by the Florida Office of Waterway Management, will cover 75 percent of the project's cost, and can be used for public education and for planning, permitting, purchasing and installation of pump-out equipment and portable toilet dump stations. Marinas awarded funds may charge boaters up to \$5 for a pump-out. If economically feasible, the pumpout stations should be connected to municipal sewer systems, rather than septic tanks or package plants. Another option would be to implement a portable collection system, called a "honey barge," that travels to boaters on the water and performs pump-outs.

To further encourage responsible stewardship, the Florida Department of Environmental Protection (FDEP) is developing a Clean Marina Program to encourage marinas to adopt best management practices (BMPs) — emphasizing that what is good for the environment also is good for business.

PH-3**STRATEGY**

- Step 1 Identify public marinas on the bay used by a large volume of boaters, particularly within the city of Tampa. The U.S. Coast Guard or community boating groups may be able to assist in identifying the most frequently used marinas.

Responsible parties: *City of Tampa and other municipalities, Florida Marine Patrol, Agency on Bay Management (ABM)*

- Step 2 Based on the results of Step 1, encourage the responsible municipality to apply for a state grant to construct sewage pump-out stations at marinas.

Responsible parties: *local governmental environmental management departments, ABM, Tampa Bay National Estuary Program*

- Step 3 Construct a sewage pump-out facility or explore portable methods of sewage collection at marinas awarded grants. Provide educational materials to boaters on-site explaining the importance of the facility or portable system and how to use it. Disseminate educational materials to boating clubs in the region making them aware of the facility.

Responsible parties: *local governments, local boating clubs*

- Step 4 Encourage participation in FDEP's BMP program for marinas. Consider implementing the program at a publicly owned marina to serve as an example for commercial marinas.

Responsible Parties: *local governments, ABM, Tampa Bay NEP*

SCHEDULE:

Steps 1 and 2 were initiated in 1996. Step 3's schedule is dependent upon awarding of grant, but construction could begin in 1997. Step 4 also can be initiated in 1997.

COST:

Installation and construction costs vary depending on type of equipment selected. Costs for a stationary or portable pump-out unit range from approximately \$2,000-\$6,000. Costs for a portable toilet waste station vary from \$1,100-\$1,800. With a state grant paying 75 percent of the construction costs, the project's costs to a municipality would be substantially reduced. In addition, construction and maintenance costs could be recouped by charging boaters a minimal user fee.

EXPECTED BENEFITS:

Providing sewage pump-out services for boaters will help reduce pathogens as well as nitrogen and solids in Tampa Bay.

ACTION PLAN

Water & Sediment Quality

MONITORING ENVIRONMENTAL RESPONSE:

Use of the pump-out stations can be tracked to determine effectiveness. Boaters at the participating facility also can be surveyed to ascertain if they are using the pump-out service and how it can be improved.

REGULATORY NEEDS:

None anticipated, with the exception of permits required for installation.

RELATED ACTIONS:

PH-1, PH-2, WW-2



PHOTO: NICK TOTH

Bay Habitats

Tampa Bay's rich mosaic of underwater and coastal habitats support hundreds of species of fish and wildlife, from the familiar brown pelican to the bottom-hugging sea squirt. However, since the 1950s, almost half of the bay's original salt-water wetlands have been lost to dredging and filling for shoreline and port development. Bay seagrasses declined by nearly 40 percent in this same period, although they are waging a comeback in some areas thanks to recent improvements in water quality and reduced dredging and filling.

Neighboring upland habitats of pine forest, oak hammock and shrub also have been heavily impacted by development. Almost all coastal pine forests have been eliminated from the shores of Tampa Bay. These buffer zones and associated freshwater wetlands provide critical habitat for numerous animals, including the wood stork, white ibis, bald eagle and fox squirrel.

Highly productive low-salinity tidal streams along rivers, which provide life-support to many of the bay's juvenile fisheries, also have sustained damage from development, invasive exotic plants and diversions of fresh water for irrigation.

The restoration and protection of these diverse habitats is crucial to the bay's health. Studies by the Tampa Bay National Estuary Program (NEP) suggest that more than

ACTION PLAN

Bay Habitats

12,000 acres of seagrass can eventually be recovered along the bay's shallow shelf by "holding the line" on existing nitrogen loadings and offsetting any new nitrogen increases that are expected to occur with growth. Additionally, the NEP will pursue opportunities for seagrass transplanting at select sites. Strategies to repair and preserve the bay's coastal habitats are outlined in a Habitat Restoration and Protection Master Plan finalized by the NEP in 1996 in cooperation with area agencies and local governments. The plan seeks to restore a productive balance and diversity of coastal and associated upland habitats and includes a preliminary list of priority projects for restoration. The overall target is to restore a minimum of 100 acres of low-salinity tidal marsh habitat every five years and to protect and enhance the bay's existing salt marsh and mangrove areas.

Habitat protection, through public land acquisition and conservation easements on private property, is the other focal point of the habitat master plan for Tampa Bay, which identifies 28 specific sites as priorities for protection. The majority of these sites were incorporated into the 1996 Save Our Rivers/Preservation 2000 Plan of the Southwest Florida Water Management District (SWFWMD), dramatically increasing the chances that these vital coastal lands will be acquired and protected given available funding.

Recent developments have brought more good news. In December 1995, SWFWMD purchased nearly 1,600 acres of bayfront property at Terra Ceia Isles in Manatee County. Acquisition of this important tract brings more than 6 percent of the bay's total mangrove acreage, and several hundred acres of vital low-salinity, freshwater and upland habitat, into public ownership and substantially boosts restoration opportunities. Several adjacent parcels of land totaling about 4,700 acres have been proposed for purchase under the state's Conservation and Recreational Lands (CARL) Program.

Finger-fill residential canals constructed in the 1950s and 1960s are a special area of focus because of degraded water quality, habitat loss and siltation. This action plan outlines incentives and opportunities for homeowners to enhance canal habitats and soften shorelines.

GOALS FOR BAY HABITATS

- Increase and preserve the quantity, quality and diversity of seagrass communities. The long-term goal is to restore 12,350 acres of seagrass and protect the bay's existing 25,600 acres.
- Restore an optimum balance of wetland and associated upland habitats for fish and wildlife, while protecting and enhancing existing habitats. Specific targets include:
 - restoration of a minimum of 100 acres of low-salinity tidal marsh every five years, for a total increase over time of 1,800 acres, and the preservation of the existing habitat
 - protection and enhancement of the bay's mangrove and salt marsh communities which total nearly 14,000 acres
 - restoration over time of 150 acres of salt barren habitat

- Protect hard-bottom, oyster reef and soft-bottom communities.

SUMMARY OF ACTIONS FOR BAY HABITATS

- BH-1 Implement the Tampa Bay master plan for habitat restoration and Protection.
- BH-2 Establish and implement mitigation criteria for Tampa Bay, and direct mitigation to high priority projects.
- BH-3 Reduce propeller scarring of seagrass and pursue seagrass transplanting opportunities at select sites.
- BH-4 Restrict impacts to hard-bottom communities.
- BH-5 Improve management of parking and access areas along causeways and coastal areas.
- BH-6 Encourage waterfront residents to enhance shorelines and limit runoff from yards.
- BH-7 Improve compliance with and enforcement of wetland permits.
- BH-8 Expand habitat mapping and monitoring programs.

NOTE: An additional action in the draft Tampa Bay management plan recommended the passage of a law requiring mandatory education of boaters. The Florida Legislature approved a phased-in boater education bill in 1996.

BH

Implement the Tampa Bay Master Plan for Habitat Restoration and Protection

ACTION:

Implement the Tampa Bay Master Plan for Habitat Restoration and Protection, developed by the Tampa Bay National Estuary Program (NEP) in cooperation with local, regional and state agencies and interests.

BACKGROUND:

Recognizing that some coastal habitats have been lost in greater proportion than others, the NEP Master Plan for Habitat Restoration and Protection seeks to restore the historic balance of habitats in Tampa Bay. The Plan outlines specific strategies and goals to increase certain habitats while preserving and enhancing those that now exist.

The Plan emphasizes the restoration of low-salinity tidal streams found along the dozens of meandering creeks that eventually enter Tampa Bay. These quiet areas, critical to the life cycle of fish such as snook and mullet and birds like the great blue heron and snowy egret, comprised about half of all estuarine wetland habitats at the turn of the century. Today, these low-salinity habitats make up about 22 percent of the total. In contrast, mangrove forests also made up about 50 percent of the shoreline in 1900. Today, they account for about 73 percent of the remaining shoreline vegetation — although mangroves — like all of the bay's habitats — have experienced substantial declines in acreage.

The plan seeks to restore a minimum of 100 acres of low-salinity tidal streams every five years, while preserving and enhancing existing mangrove and salt marsh vegetation. The Plan also identifies 28 sites as priorities for habitat protection, either through direct purchase of lands or other means such as conservation easements on private property. Most of these sites were recently incorporated into the Southwest Florida Water Management District's (SWFWMD) Save our Rivers/Preservation 2000 Plan, which sets priorities for public lands acquisition.

While the NEP Plan most heavily focuses on repairing tidal streams, other habitats also will be gradually restored. Attention will be directed to salt barrens (extremely salty high marsh), upland forests and mud flats, all of which play an important role in the Tampa Bay ecosystem. The NEP's Habitat Restoration Subcommittee has adopted the Florida Game & Freshwater Fish Commission's (FGFWFC) strategies for upland restoration. Upland protection needs will be met in part through local land acquisition efforts.

The concept of restoring the balance is relatively new and has important implications for Tampa Bay and other coastal areas. Traditionally, habitat restoration and land acquisition have been largely opportunistic endeavors: Agencies and communities have sought to purchase and restore habitat based on what was available or, in some cases, most visibly connected to the bay. This approach toward highly visible projects helped to build community awareness of the environmental plight and needs of the

bay at a time when this was critically needed. It also demonstrated to skeptics that habitat restoration was possible.

In recent years, restoration efforts have increasingly focused on providing a mosaic of habitat types within a given project to maximize the benefits to fish and wildlife. The NEP Plan takes this concept a step further by developing restoration and protection goals based on the needs of key wildlife “guilds,” or groups of animals that share common habitat and feeding preferences.

The white ibis provides a textbook example of how this new planning approach might protect an impacted species. Populations of the white ibis have declined dramatically in the last half-century, resulting in its listing by the FGFWFC as a species of special concern. Adult ibis nest along the bay, but require inland freshwater sources of food for their young. These shallow freshwater wetlands or “frog” ponds have been hard hit hard by development — forcing the ibis to travel farther and farther to find food for their young.

The NEP Plan outlines four management strategies for the protection and restoration of seasonal freshwater ponds. The first is to identify and protect all potential ibis foraging habitat within a certain distance from the bird colonies in Tampa Bay. The second is to create a wetland mitigation banking system that creates or restores seasonal marshes within these foraging areas before these impacts become unavoidable. One potential location for such a bank is the combined TECO and Reeder Farms property south of Cockroach Bay where three of the four white ibis foraging zones overlap.

The third strategy is to create or restore marshes on publicly owned land. Finally, the Plan recommends that communities and agencies actively seek to acquire new properties for habitat restoration and protection, and especially for seasonal marsh restoration.

Other components of the NEP Plan address management of public lands, especially exotic species control and eradication. The Plan also seeks to direct mitigation to priority restoration projects using criteria discussed in Action BH-2. The Habitat Restoration and Protection Master Plan for Tampa Bay is available under separate cover from the NEP.

ONGOING EFFORTS:

Already, about 100 acres along Tampa Bay have been restored through projects financed primarily by the SWFWMD’s Surface Water & Management (SWIM) program and the Florida Department of Environmental Protection’s Pollution Recovery Trust Fund. Several projects now underway and in the planning stages will boost that number by up to 1,000 acres.

Pinellas, Hillsborough and Manatee counties all have administrative programs for the public purchase of environmentally sensitive lands. Pinellas and Hillsborough counties’ programs are funded by local taxes that complement state-funded public land acquisition programs such as Preservation 2000, Save Our Rivers, and Conservation and Recreational Lands (CARL). Manatee County’s program is for the purchase of land in the Lake Manatee Reservoir and is financed by the county’s Water Utilities

BH-1

ACTION PLAN

Bay Habitats

Enterprise Fund. Private land acquisition programs such as the Nature Conservancy also contribute to the preservation of upland and wetland habitats.

STRATEGY:

This action presents steps to implement the Tampa Bay Master Plan for Habitat Restoration and Protection, including elements to secure and preserve funding sources.

- STEP 1** Finalize the list of priority restoration projects compiled from the individual plans of various agencies and local governments.
Responsible parties: Tampa Bay NEP, in cooperation with the established workgroup of agencies, organizations and local governments
- STEP 2** Ensure that priorities for habitat restoration and protection are incorporated into the 1997 action plans submitted to NEP by local governments and agencies for implementation of the CCMP. Additionally, ensure that these projects are incorporated into local government and agency permit reviews and conditions.
Responsible parties: local governments, FDEP, SWFWMD, FGFWFC
- STEP 3** Direct public and private mitigation to restoration projects identified as priorities. (See Action BH-2 on mitigation banking)
Responsible parties: FDEP, SWFWMD, FGFWFC, Environmental Protection Commission (EPC) of Hillsborough County
- STEP 4** Reconvene work group every two years, beginning in 1998, to assess progress toward goals and to reevaluate priorities.
Responsible parties: Tampa Bay NEP
- STEP 5** To support implementation of restoration and protection efforts:
- Pursue a permanent source of funding for the SWIM Program;
 - Secure funding for the Florida Marine Research Institute's Marine Habitat and Restoration Program, which was discontinued recently due to state funding cutbacks;
 - Secure a permanent source of funding for Preservation 2000, the state environmental lands acquisition program;
 - Amend provisions of the Hillsborough County Pollution Recovery Trust Fund to require that monies collected from fines be spent within a reasonable period of time.

SCHEDULE:

Step 1 is ongoing with finalization of priorities anticipated in early 1997. Several restoration projects are already underway and considerable progress is being made in the area of public lands acquisition and preservation. Remaining steps will be initiated in 1997.

COST:

Implementation costs for specific projects will be included in the action plans of responsible agencies and local governments. However, existing SWIM habitat restoration projects may provide some basis for comparison. The current SWIM plan for Tampa Bay includes a total of 16 major and 15-21 smaller projects with a total budget of \$4.5 million or about \$1.5 million annually. SWFWMD cost analyses indicate that the cost for the creation/restoration of intertidal wetlands (including design, permitting, plans, construction and monitoring) range from \$30,000 (managed in-house) to \$50,000 (contracted to private firm) per acre, excluding land costs.

BH-1**EXPECTED BENEFITS:**

Implementation of this plan will improve the quality, diversity and quantity of critical coastal habitats that support bay wildlife.

MONITORING ENVIRONMENTAL RESPONSE:

Progress in implementing the habitat restoration and land acquisition master plan and in meeting specific targets for habitat recovery will be monitored by local governments and agencies and reported in a Biennial Bay Monitoring Report.

REGULATORY NEEDS:

Revisions to trust fund provisions and other regulatory changes may be necessary to ensure consistent funding for habitat restoration and acquisition.

RELATED ACTIONS:

BH-2, BH-8

Establish and Implement Mitigation Criteria for Tampa Bay and Identify Priority Sites for Mitigation

ACTION:

Establish criteria for mitigation of impacts to tidal habitats in the Tampa Bay watershed, and develop a regional mitigation banking plan that implements those criteria.

BACKGROUND:

Mitigation—the process by which applicants whose projects impact wetlands create new ones in their place or restore or enhance existing wetlands—is required of both private developers and public agencies in Florida to compensate for loss of natural habitats. Typically, these manmade wetlands are established on the same site as the project, in an area not slated for development.

But keeping track of these projects—and how closely they mimic natural wetlands—has proven difficult with the government's limited resources. Studies by the Florida Department of Natural Resources' Aquatic Preserves Division and Marine Research Institute in 1988 reported a failure rate of more than 80 percent for mitigation projects in Southwest Florida and Tampa Bay. A follow-up study conducted by the Florida Department of Environmental Protection (FDEP) revealed that one-third of applicants issued permits by the agency had never even attempted the required mitigation. Of those that had, only 13 of 62 mitigation projects were deemed "ecologically successful," meaning they generally provided the same functions as natural wetlands destroyed by the project.

In addition to problems with enforcing mitigation requirements, some bay managers believe the mitigation criteria used by the state is insufficient to protect some particularly valuable bay habitats.

Problems with the current mitigation program, and pressures from private interests who view it as too cumbersome, have led to a new concept called "mitigation banking." It allows developers to compensate for wetland losses in one place by preserving, restoring or creating wetlands in another to achieve a no-net loss of wetlands.

A new FDEP rule allows mitigation banking in some instances, although it remains a controversial issue. Proponents say mitigation banking can consolidate man-made marshes into central areas, increasing the odds for success and making the permits easier to monitor and enforce. Proponents also say it will result in larger wetland areas that are more useful for birds and other wildlife than, for instance, a tiny wetland in the middle of a shopping center or along a busy road. Critics say mitigation banking will make it easier to destroy wetlands. If an applicant can simply pay to restore marshes somewhere else, they fear there will be little incentive to preserve wetlands on site. Many concerns about mitigation banking stem from provisions (or lack of provisions) in the new state rule.

Under the rule, mitigation banks are optional and can be either publicly or privately owned or operated. The state encourages a free-market approach, so does not specify how much a developer can be charged for mitigation credits. Generally, the price of credits covers the cost of the restoration and monitoring for several years, in addition to providing a margin of profit for the private restoration company. Banks are jointly administered by the FDEP and the state's water management districts.

The state rule also allows private companies to purchase lands for mitigation banks, or developers themselves to purchase and operate mitigation banks. Additionally, the new rule permits developers to transfer their mitigation to publicly owned lands if the landowner agrees, as is the case with a bank on state-owned property at Little Pine Island in Lee County.

Whether mitigation banks should be permitted on publicly owned lands is a key area of disagreement among bay managers. Some believe mitigation should only be allowed on private lands, with those lands subsequently turned over to a public agency for management. Others say mitigation banking offers a chance to restore damaged public lands much faster than limited government funds currently permit.

The shortcomings of the current mitigation program and the lack of a significant track record on wetland mitigation banking will continue to make the issue of how and where banks should be used complex and controversial.

The Tampa Bay National Estuary Program (NEP) supports the development of mitigation criteria for the Tampa Bay region, including the development of a regional mitigation banking plan that addresses specific habitat needs and priorities. A workgroup of the Natural Resources Committee of the Agency on Bay Management (ABM) was convened in May 1996 to evaluate existing guidelines and develop recommendations. Participants have reviewed and compared federal, state and local criteria for mitigation banking, as a first step in developing recommendations for the Tampa Bay region. The group also is identifying areas that may be desirable for banking, based on priorities for restoration and protection established in the NEP's Master Plan for Habitat Restoration and Protection (see Action BH-1).

A regional mitigation banking plan would accomplish several goals. First, it would ensure appropriate siting of banks in areas where they are most likely to succeed and where other valuable habitats, such as mature pine forests, are not sacrificed for wetlands. A regional plan also would prevent a profusion of widely scattered banks that are difficult to monitor, and would give local governments guidance in drafting future land-use plans.

Permitting agencies should continue to emphasize avoidance of wetland impacts in lieu of on- or off-site mitigation. Where wetlands impact cannot be avoided, on-site mitigation should be encouraged if it is likely to be effective. If on-site compensation is not feasible, mitigation banking should be encouraged.

STRATEGY:

- STEP 1** Identify areas where mitigation banks should be used in the Tampa Bay watershed, and develop criteria for management and operation of those banks.
- A. Generate a map that identifies all existing and proposed preserves and major conservation easements, using the NEP's 1996 base map from the Habitat Restoration and Protection Plan for Tampa Bay and the Game & Fresh Water Fish Commission's Regional Wildlife Habitat Plan (1996). Identify areas best suited to mitigation banking.
 - B. Evaluate and recommend criteria for mitigation banking in the Tampa Bay region. The ABM workgroup has considered:
 - whether mitigation conducted by local governments and private developers should count toward overall habitat restoration goals for Tampa Bay. Projects which produce a net increase in valuable estuarine, oligohaline and native upland watershed habitats should "count" toward the overall restoration goals for Tampa Bay.
 - specific criteria to decide when on- or off-site mitigation is most appropriate. Recommendations being developed.
 - ownership, management and associated cost issues, including whether mitigation banks operated on private lands purchased by the developer or private bank operator should be deeded to a public agency. Recommendations being developed.
 - limitations on the total number of mitigation banks, and the number that one private operator can manage, and provisions to make banks large enough to increase ecological values and prevent a glut of banks with no "customers." Recommendations being developed.
 - siting considerations, to ensure that wetland values lost in one area are replaced in the same general area, thus preventing an overall decline in water quality or habitat within one watershed (for example, positioning banks adjacent to existing wetlands could make replicating the types of wetlands lost easier, increase its probability of success, and boost its value to wildlife). Another issue involves siting banks in areas that fill gaps in existing wildlife habitat corridors. Workgroup is evaluating FDEP language to decide if changes are needed.
 - provisions to ensure the bank mimics as closely as possible the values, appearance and function of the original habitat. Where this is not practical, mitigation credits should be granted at a higher ratio, as in low-salinity tidal streams, salt barrens, hard-bottom communities or other critical habitats within Tampa Bay. The following ratios have been presented for consideration: 2:1 (creation), 4:1 (restoration/enhancement), 10:1 (preservation). [from Scientifically Defensible Compensation Ratios for Wetland Mitigation]

- bank monitoring, enforcement and penalties for noncompliance. Recommendations being developed.
- provisions for preservation of existing wetlands within a mitigation bank as compensation if the environmental benefits of such activity will significantly exceed the level of impact. Recommendations being developed.
- whether mitigation banks should be considered a replacement for publicly financed restoration projects. Mitigation banking should not replace publicly financed restoration. However, the potential exists for some mitigation banking credits to be generated by local governments for restoration projects that produce a net habitat gain and help achieve the goals of the bay restoration plan.
- safeguards to protect productive native uplands from conversion to wetlands. The group is strongly opposed to converting productive native uplands to wetlands. Recommendations being developed.
- mandating the establishment of a trust fund to ensure long-term management of the mitigation bank. The trust fund could be managed by a public agency, with additional oversight by a non-profit group such as The Nature Conservancy. The group supports this concept. Most existing mitigation banking criteria address this issue.

Private industry and other non-governmental and environmental groups have been urged to participate. Recommendations will be forwarded to the Tampa Bay NEP in early 1997 following review by the full Agency.

Responsible parties: ABM

- STEP 2 Implement recommendations from Step 1, and direct mitigation of estuarine impacts to high-priority restoration areas identified in the Tampa Bay NEP Habitat Restoration and Protection Master Plan. (See Action BH-1)
- Responsible parties: Tampa Bay NEP, in conjunction with U.S. Army Corps of Engineers, FDEP, Southwest Florida Water Management District, Florida Game & Fresh Water Fish Commission, Environmental Protection Commission of Hillsborough County and local governments***

SCHEDULE:

Step 1 is underway with recommendations to be provided to NEP in early 1997. Step 2 can be initiated in 1997.

COSTS:

To be determined, based on recommendations of the workgroup.

EXPECTED BENEFITS:

Effective mitigation banking can consolidate manmade wetlands into central areas, increasing the odds for success and making permits easier to monitor and enforce. It

BH-2

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also can result in larger wetland areas that are more useful for birds and other wildlife. The development of specific criteria for mitigation banking in the Tampa Bay region will help assure that mitigation banking is conducted in the most environmentally beneficial manner.

MONITORING ENVIRONMENTAL RESPONSE:

Wetland habitats are monitored every five years using photo interpretation. The success of mitigation banks will be monitored through permits.

REGULATORY NEEDS:

Possible amendments to local permitting rules and/or the state mitigation banking rule.

RELATED ACTIONS:

BH-1

Reduce Propeller Scarring of Seagrass and Pursue Seagrass Transplanting Opportunities at Select Sites

BH-3

ACTION:

Reduce propeller scarring of seagrasses and other shallow marine habitats through boater education and by installing channel markers in appropriate areas to direct traffic. Additionally, pursue seagrass transplanting opportunities at select sites to assist natural seagrass recovery efforts.

BACKGROUND:

Boating activity on Tampa Bay is intense and increasing — along with damage to seagrass meadows and other sensitive marine habitats. Nearly 100,000 boats are registered to anglers and boating enthusiasts in the three counties bordering the bay, along with dozens of smaller commercial fishing vessels.

Propeller scars from boats that cut through shallow seagrasses beds or run aground can leave sandy trenches that may stay barren for years. Seagrasses in some sections of Tampa Bay — including portions of Cockroach Bay Aquatic Preserve, Fort DeSoto Park, Bishops Harbor, Rattlesnake Key and the Double Branch/Rocky Creek portion of Upper Tampa Bay — are severely scarred, particularly around narrow channels and passes.

Additionally, turbidity created when jet-powered personal watercraft repeatedly stir up the bottom sediments in shallow areas of the bay may cause long-term damage to grass beds.

The Florida Marine Research Institute (FMRI) recently completed a study for NEP investigating methods to protect seagrasses in heavily scarred areas of Tampa Bay. FMRI also conducted extensive mapping of seagrass scarring in the bay and evaluated management methods used through the state. Their recommendations are to install channel markers in Miguel Bay and Bishops Harbor in Manatee County and at Tierra Verde in Pinellas County, along with interpretive signage at boat ramps and near grass beds. The NEP approved \$30,000 in 1996 to fund these projects.

Boating restriction zones have been established at Cockroach Bay Aquatic Preserve in Hillsborough County and Fort DeSoto Park, Weedon Island State Preserve and Honeymoon Island State Park in Pinellas County, and monitoring is underway to evaluate the effectiveness of various management methods. These range from motor boat exclusion and restricted access areas to unrestricted areas where sensitive grass beds are posted with interpretative signs. Channel marking and education appear to be the most cost-effective techniques for reducing prop scarring.

Interpretive signs at high-use boat ramps around the bay can help to raise boater awareness of sensitive seagrass meadows and emphasize the importance of using

marked channels to avoid damaging grass beds. Expanding this effort to other areas of intense use is another important strategy advocated by the NEP. The Boater's Guide to Tampa Bay also is an excellent educational tool. More than 100,000 guides have been distributed to boaters in the bay's three surrounding counties since its first printing in 1992. An updated version of the Boater's Guide, which is produced by the Tampa Bay NEP and FMRI, will be available in March 1997.

Seagrass transplanting also should be pursued at select sites to assist natural seagrass recovery efforts, which can take up to 10 years for some species. Pioneering efforts by scientists at the FMRI to culture plant fragments in the laboratory for transplanting in the bay show promise, although the process is lengthy and expensive. Use of "donor" grasses transplanted from existing meadows may be a more cost-effective approach and has already been successful in some areas of the bay. The NEP will evaluate suitable areas for smaller-scale projects as part of the overall seagrass restoration strategy.

STRATEGY:

STEP 1 Install channel markers and interpretive signs at Bishops Harbor, Tierra Verde and other priority sites where boating or personal watercraft activity pose a threat to seagrasses.

Responsible parties: local governments, with funding assistance from the Tampa Bay NEP

STEP 2 Continue to monitor seagrass scarring and protection methods to evaluate impacts, recovery and opportunities to reclassify restricted areas.

Responsible parties: local governments and FMRI

STEP 3 Pursue seagrass transplanting opportunities at suitable sites to enhance natural seagrass recovery efforts.

Responsible parties: FMRI, NEP, Tampa Bay Watch

STEP 4 Expand distribution of the Boater's Guide to Tampa Bay at boat shows and through major marinas, boating and fishing clubs, retail outlets and boat ramps.

Note: More than 100,000 Boater's Guide have been distributed in the three counties bordering the bay. Reprints of the Boater's Guide with new and updated information will be available in March 1997.

Responsible parties: FMRI and NEP, with assistance from Florida Marine Patrol, Coast Guard Auxiliary, Tampa Bay Watch, Florida Sea Grant Extension Program

STEP 5 Identify high-use boat ramps not already posted and design and install interpretive signage in these areas to educate boaters and personal watercraft users about bay habitats and their role in habitat protection. Ideally, sign design should be uniform throughout the watershed to maximize cost-efficiency and impact.

Responsible parties: FMRI, with assistance from local governments and Tampa Bay Watch

STEP 6 Finalize and distribute a boat decal on prop scarring to boaters, boat rental and sales outlets, and tackle shops.

Responsible parties: Tampa Bay NEP (for design and initial production), FMRI, Tampa BayWatch, Florida Marine Patrol and local government marine units and tax collectors' offices (for distribution)

Note: Preliminary designs for a boater decal have been developed by the Tampa Bay NEP.

 **BH-3**

SCHEDULE:

Step 1 will be implemented in 1997 with funding from the Tampa Bay NEP. Steps 2-4 are ongoing. Steps 5 and 6 will be initiated in 1997.

COST:

The costs to install channel markers and interpretive signage in areas identified in Step 1 is approximately \$15,000 per site. Funding for these projects will be provided by the NEP. The cost of transplanting seagrasses varies considerably, from about \$1.50 to \$2 per unit of seagrass. On average, transplant costs are estimated to be about \$200 a day, based on two people working eight hours and transplanting between 100-200 units.

EXPECTED BENEFITS:

Targeted efforts to educate boaters, coupled with channel marking and enforcement of management zones, will reduce prop scarring of seagrasses. Other sensitive bird and coastal habitats also will benefit as boaters become aware of how to protect them.

MONITORING ENVIRONMENTAL RESPONSE:

Prop scarring is monitored by local governments in areas where boating restrictions have been established. A responsible party for baywide prop scarring monitoring has not yet been determined. Seagrass coverage is monitored every two years by Southwest Florida Water Management District's Surface Water Improvement and Management Program.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

BH-1, FW-1

Restrict Impacts to Hard-Bottom Communities in Tampa Bay

BH-4

ACTION:

Evaluate the extent of hard-bottom communities in Tampa Bay and develop special permitting and mitigation criteria to reduce impacts to those communities.

BACKGROUND:

The vast majority of the submerged bay bottom in Tampa Bay is characterized by loose sediments such as sand or mud. Subtidal hard-bottom, or live-bottom, communities exist in sparse areas of the bay bottom where natural rock outcrops protrude into the overlying water column. The hard surface of the rock provides an ideal substrate for colonization by a diverse assemblage of marine invertebrates including sponges, gorgonians and corals, and the shelter afforded by the rock outcrops attracts large numbers of a wide variety of fishes. These characteristics make hard-bottom communities among the most unique and highly productive natural habitats in Tampa Bay.

Hard-bottom communities are known to exist in Old Tampa Bay near Rocky Point and the Gandy Bridge, as well as southwest of the Skyway Bridge near Terra Ceia Bay. However, the baywide distribution of these important habitats — particularly in deeper waters — remains undocumented.

Oyster reefs are another type of hard-bottom community found in Tampa Bay. They typically occur in shallower waters along the shoreline, predominantly within the intertidal zone and provide a unique substrate for other encrusting organisms. Relatively little is known about the distribution and health of Tampa Bay oyster reefs despite their recognized importance and potential economic value.

The new state Environmental Resource Permit typically requires permittees to provide compensatory mitigation (e.g., wetland creation, restoration, enhancement) for permitted wetland impacts after the impacts have occurred. The amount of mitigation required is based upon guidelines for the ratio of impact acreage to mitigation acreage, but is usually negotiated on a case-by-case basis. Current rules, however, do not distinguish estuarine hard-bottom communities from other types of regulated wetlands and submerged bottom types. Consequently, these unique habitats are typically not afforded any additional regulatory protection — except in the Florida Keys, where a model rule expanding protection of that area's unique seagrasses, microalgae and corals has been developed. While it is not clear how many acres of natural hard-bottom communities have been lost in Tampa Bay, it is clear that impacts to these unique habitats are not easily mitigated, and that greater recognition and protection is needed.

This action would provide for the identification of hard-bottom communities in the bay through a comprehensive survey, and subsequent protection of identified areas through the development of special permitting and mitigation criteria. The additional protections could be achieved either through statewide rulemaking or amendments, or through adoption of local rules or policies specifically targeting Tampa Bay.

BH-4**STRATEGY:**

STEP 1 Undertake a comprehensive benthic survey of Tampa Bay with the objective of mapping the detailed distribution of natural hard-bottom communities, including both oyster reefs and rocky outcrop live-bottoms. A small-scale survey of hard-bottom communities has been completed, but a more detailed investigation is needed. The survey would document the species composition and ecology of natural hard-bottom communities and compare them to artificial reef communities, which often are used to mitigate impacts to live-bottom communities. The Environmental Protection Commission (EPC) of Hillsborough County could assume this task as part of its annual benthic sampling program in Tampa Bay, if additional funding is secured. Volunteers also could be utilized to survey shallow-water hard-bottoms such as nearshore oyster reefs. Ensure the distribution of resulting maps to applicable regulatory agencies and local governments so that these areas are recognized in permitting decisions.

Responsible parties: Florida Department of Environmental Protection (FDEP), EPC, Tampa BayWatch, Florida Sea Grant Extension Program

STEP 2 Evaluate the effectiveness of current permitting and mitigation rules in preserving hard-bottom habitats, and recommend ways to provide increased protection. (This process should be integrated with development of special mitigation criteria for Tampa Bay as directed in Action BH-2) The advisory group may wish to use the Florida Keys model rule as a starting point for comparison. Additionally, the group should explore whether regulatory agencies already have authority to adequately protect live-bottom habitats, or whether new statewide or local rules, or expansion of existing rules, is needed.

Responsible parties: Agency on Bay Management (ABM)

STEP 3 Implement the ABM recommendations regarding the protection of specific hard-bottom habitats.

Responsible parties: FDEP (if state rule changes are deemed necessary) or local governments

SCHEDULE:

Step 1 can be initiated in 1998. Step 2 can be accomplished in 1998, with recommendations forwarded to the Tampa Bay NEP and FDEP by the end of that year.

COST:

The benthic survey could be conducted for approximately \$50,000-\$100,000. Financing options include Florida Sea Grant, local governments and research funds available through Florida Salt Water Fishing License revenues.

EXPECTED BENEFITS:

More effective protection of natural hard-bottom communities in Tampa Bay.

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MONITORING ENVIRONMENTAL RESPONSE:

The bay monitoring program will include a hard-bottom mapping element, to be updated periodically (every 10 years).

REGULATORY NEEDS:

Possible amendments to Chapters 62-312 and 40D-4, FAC.

RELATED ACTIONS:

BH-1, BH-2, BH-8

Improve Management of Parking and Vehicle Access Along Causeways and Coastal Areas

ACTION:

Improve management of parking and vehicle access along environmentally sensitive areas of bay causeways and coastal areas.

BACKGROUND:

The sandy shoulders along the bay's causeways have become popular impromptu recreation spots. On any weekend, the "beaches" along the Gandy and Courtney Campbell causeways, the Pinellas Bayway and the approach to the Sunshine Skyway Bridge are packed with cars, people, jet-powered personal watercraft and dogs.

Most of these makeshift beaches along the bay have no parking or sanitary facilities and few restrictions on use. Vehicles travel up and down the shoreline, eroding it and preventing emergent vegetation from growing. On the Gandy Causeway, the Florida Department of Transportation (FDOT) periodically dumps and grades new sand on the access area, but much of it is washed into the water by the constant traffic.

At all the sites, people have carved paths through mangroves in order to park right on the edge of the bay. Mangroves also are "trimmed" by beachgoers for campfires. Lack of sewage and trash facilities pose aesthetic and water quality problems for the bay, while the varied and often incompatible activities that occur there (i.e., personal watercraft users sharing a relatively limited space with swimmers and anglers) often present a safety concern.

No information exists on exactly how many people visit these areas, but observations indicate that hundreds use these areas every weekend, especially during the spring and summer.

At the request of the Tampa Bay NEP, the Agency on Bay Management (ABM) has identified four areas along Tampa Bay where improvements in traffic and parking would improve the safety of beachgoers and reduce the environmental damage done to these areas, while still allowing people to enjoy the shoreline. Recommendations include the installation of bollards — short wooden or cement poles planted vertically in the ground close together — to keep vehicles out of environmentally sensitive areas. These areas, and specific management recommendations, are as follows:

• Gandy Causeway

On the southern shoreline, ABM recommends installing bollards along the future FDOT access road to allow parking but prevent vehicles from driving near mangrove areas. The bollards will protect the mangroves that currently exist and allow for growth of new intertidal plants.

Unrestricted parking will still be available at the western end for the private boat ramp and restaurant, and all along the eastern sandy shore area — which is the most popular gathering place for beachgoers.

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On the northern shoreline, ABM recommends placing bollards along the roadway to prevent vehicles from pulling off the road and into mangrove areas. This action would guard against an increase in off-road traffic in this area once FDOT completes removal of Brazilian pepper trees there.

• **Fourth Street at I-275**

ABM recommends lining both sides of the causeway with bollards above the jurisdictional line. This will allow vehicle access along the causeway and foot access down to the water, while preventing vehicles from entering the mangrove fringe or high marsh areas. Ideally, this project should be timed to coincide with the Gandy bollard project, to prevent a shift in beach traffic from Gandy to Fourth Street.

• **Pinellas Bayway/Tierra Verde**

ABM recommends placing bollards above the jurisdictional line on the northern side of the Bayway, between the first bridge and the golf course. This project would prevent vehicle intrusion into wetland areas, while still permitting vehicles to pull off the road and park. Bollards also should be placed across the sand spits on either side of the bridge to keep vehicles out, but allow personal watercraft, sailboards and other recreational equipment to be carried or pulled to the water's edge. A similar bollard barrier should be placed as needed along the causeway approach to Fort DeSoto Park.

• **Sunshine Skyway Causeway**

ABM recommends installing bollards above the jurisdictional line on the south side of the causeway across from the Blackthorne Memorial. Windsurfers and personal watercraft users will still be able to carry or pull their equipment to the water's edge. ABM also suggests that consideration be given to installing bollards on either side of the two short bridges along the Skyway approach.

If additional management of these areas is desired, sanitary and trash facilities, security lights and picnic facilities could be installed. Mangroves and marsh grass could be planted to revegetate sections of the shoreline, and a small fishing pier or boardwalk could discourage foot traffic through these vegetated areas.

Limiting access to these areas will be the responsibility of whoever maintains the road or causeway. In most cases, that will be either the FDOT or a county transportation department. Enforcement would be provided by local law enforcement agencies. Possible sources of funding for the improvements include federal and state grants (such as FDOT's Intermodal Surface Transportation Efficiency Act [ISTEA] grant program) and local governments. Local utility companies also may be willing to provide bollards at no cost.

STRATEGY:

STEP 1 Obtain local and state approval of the management recommendations developed by the ABM. The ABM recommendations are expected to be considered by Pinellas County and the Tampa Bay Regional Planning Council (TBRPC) in late 1996, and then submitted to the FDOT shortly afterwards.

Responsible parties: ABM in cooperation with the TBRPC, FDOT and applicable local governments

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- STEP 2** Implement restrictions on designated causeways and coastal roads. A pilot project at a single site could be implemented first, to gauge public reaction and effectiveness. Other sites could follow, drawing upon the lessons learned at the test site. One site that might serve as a test area is the Pinellas Bayway/Tierra Verde approach to Fort DeSoto Park, where improvements would facilitate increased protection of the park's outstanding resources.

Responsible parties: FDOT, local government transportation departments

- STEP 3** Develop and implement a recreation plan for causeway beaches that enhances the environmental integrity of the areas while still allowing passive recreation. The plans could include sanitary and trash facilities, boardwalks and habitat restoration components. This is an optional step that depends heavily upon availability of local government funding, although some components—such as shoreline cleanups and habitat restoration projects—could be accomplished with volunteer labor.

Responsible parties: local government parks and transportation departments, volunteer groups such as the Bay Area Environmental Action Team and the Bay Conservation Corps of Tampa Bay Watch.

SCHEDULE:

Steps 1 and 2 can be implemented in 1997, following approval of recommendations. Other sites could follow in 1998, with a detailed causeway recreation plan developed in future years as funding becomes available.

COST:

Implementation varies considerably according to how extensive the measures are. The cost of installing bollards in designated parking areas is approximately \$32 per bollard. At least 20-30 bollards would be needed at most sites, for a total cost of about \$1,000 per site. That cost could be significantly lower if utilities provide bollards free of charge. Implementing a full-scale recreational facility, with restrooms, picnic tables and other amenities would cost a minimum of \$100,000 per site, with annual operating expenses estimated at as much as \$80,000, based on two full-time staff people, one vehicle, regular trash pickup and other services.

EXPECTED BENEFITS:

Controlling vehicle access will permit emergent vegetation to recolonize now-barren areas of the bay shoreline, improving fish and wildlife habitat, reducing erosion and adding to the aesthetic appeal of the bay.

MONITORING ENVIRONMENTAL RESPONSE:

Any marsh or mangrove plantings conducted at the sites will be monitored by the appropriate state or local agency.

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REGULATORY NEEDS:

None anticipated. Enforcement of the vehicle access restrictions can be accomplished under existing local ordinances.

RELATED ACTIONS:

BH-1

Encourage Waterfront Residents to Enhance Shorelines and Limit Runoff from Yards

ACTION:

Encourage waterfront residents to enhance or naturalize shorelines and limit runoff from yards.

BACKGROUND:

About half of Tampa Bay's natural shoreline has been altered by development or hardened through the construction of seawalls, piers and jetties that limit plant and animal life. These changes have led to significant declines in intertidal marsh and mangrove habitat, which supply food and shelter for marine creatures and filter pollutants contained in runoff.

This action presents steps to encourage waterfront residents to soften or enhance seawalls and degraded natural shorelines with native vegetation, limestone rip-rap, terracing or habitat reefs. When properly designed, these improvements not only benefit the environment, but also can boost property values by improving shoreline stability and aesthetic appeal. However, cost, permitting complexity and lack of information about suitable options are often key deterrents to homeowners, who also are limited by site-specific considerations.

Currently, residents who wish to stabilize their shoreline may need to obtain a general permit to install rip-rap or to soften existing structures, but the criteria for obtaining this permit vary according to the nature of the surrounding shoreline and the type and amount of work proposed. Exempting certain types of enhancement activities from the permit requirement, or mandating only that the homeowner notify Florida Department of Environmental Protection (FDEP) of the work — a noticed exemption — may encourage more residents to undertake these projects.

Local communities seeking to encourage waterfront residents to enhance shorelines may gain the most by targeting larger, finger-fill communities, where group permits are feasible, especially when seawalls are replaced or repaired. The City of Clearwater's Environmental Advisory Board, for example, has discussed the possibility of allowing homeowner groups to adopt a management plan for their shorelines to encourage the planting or preservation of mangroves. The management plan would specify mangrove trimming guidelines, and homeowners who agree to abide by the guidelines could do the pruning themselves, instead of having to hire a landscape architect as mandated by the current state mangrove trimming rule.

Limiting pollution in runoff from waterfront yards also is encouraged. Residents can help to reduce pollution to Tampa Bay by applying the eco-landscaping techniques prescribed by the Florida Yards & Neighborhoods (FY&N) Program, which is administered by local cooperative extension services. A companion FY&N homeowner's guide, which features low-maintenance landscape design and maintenance tips, is ideally suited to the environmentally conscious waterfront resident. Adopt-A-Canal pro-

BH-6

grams also may be effective in select areas in improving water and habitat quality in canals through public stewardship and education.

STRATEGY:

The following strategy focuses on incentives and efforts to streamline procedures for residential shoreline enhancement, as well as informational resources to assist waterfront residents in evaluating shoreline options and implementing landscaping practices to reduce runoff from their yards.

- STEP 1** Develop property tax or other financial incentives to encourage habitat enhancement along seawalls, and establish cost-share programs to promote group-permit shoreline enhancement projects. For instance, property owners currently are entitled to lower property valuations if part of their property is placed in a conservation easement; perhaps a similar program could be instituted for homeowners who use alternative shoreline stabilization and enhancement techniques. Additionally, a shoreline management plan such as that proposed by the Clearwater's Environmental Advisory Board could result in significant cost-savings to participating homeowners by allowing them to trim their own mangroves under approved guidelines.
Responsible parties: local governments, Southwest Florida Water Management District (SWFWMD), in cooperation with FDEP
- STEP 2** Evaluate whether a low-cost or no-cost general permit, a noticed exemption or a full exemption is the best mechanism for encouraging shoreline enhancement, and develop criteria for review of projects that will be eligible for the streamlined permit process. Rule revisions may be needed to incorporate exemptions into existing rules.
Responsible parties: SWFWMD, FDEP, local governments
- STEP 3** Amend state statutes to require that habitat enhancement features be incorporated when seawalls are constructed or repaired.
Responsible parties: FDEP
- STEP 4** Develop and distribute a resource card (#10-envelope size) to waterfront residents through annual property tax notices to promote available tax incentives for shoreline enhancement, as well as resources and publications addressing waterfront landscaping and exotic plant control, and canal maintenance and improvement. Publications noted below should be featured.
Responsible parties: local governments and the Tampa Bay National Estuary Program (NEP) (production), local government tax assessors offices (distribution), also distribute through Tampa Bay Watch, Agency on Bay Management (ABM)
- 4.1** SWFWMD's 1993 report on Best Management Practices for Improvement of Residential Canals includes informative boilerplate text for a public brochure on enhancement of hardened shorelines. Text should be expanded to provide more detail on general shoreline design options, associated costs, and appropriate contacts, and then produced as a brochure for public distribution.

Responsible parties: SWFWMD (brochure), SWFWMD and local governments (distribution), Florida Sea Grant Extension Program

- 4.2 The FY&N Handbook, produced by the Florida Cooperative Extension Service (FCES) and the National Estuary Programs of Tampa Bay and Sarasota Bay, assists residents in designing and maintaining low-maintenance, environmentally beneficial Florida Yards, which minimize fertilizer, pesticide and water use. Special sections are devoted to waterfront landscaping, shoreline enhancement and septic tank maintenance. Local governments may arrange for reprints of this publication through FCES or refer inquiries to local cooperative extension services.

Responsible parties: local governments, FCES

- STEP 5 Explore the costs and benefits of implementing Adopt-A-Canal programs in areas with strong neighborhood associations. Include existing materials as core of a curriculum, but also promote proper boat maintenance and oil-sorb products for boat bilges. Encourage backyard maintenance-free (or low-maintenance) buffer zones to limit fertilizer and pesticides in direct runoff.

Responsible parties: local governments, Florida Sea Grant (Marine Extension agents)

SCHEDULE:

All projects can be initiated in 1997 for implementation in 1998. Incentives and cost-share options will be investigated by the Tampa Bay NEP, which also will develop boilerplate design and text for the resource card (Step 4) to provide to local governments.

COST:

NEP is investigating costs to produce: 1. Resource card-100K quantity, #10 envelope-size color cardstock, printed 2 sides/1 color; 2. Brochure on shoreline options, 25K quantity, first run.

Reprint costs for the FY&N handbook are \$1 per book. Local governments can recoup expenses by providing these materials at cost of production as an alternative to free distribution.

Financial incentives and cost-share programs may be pursued through existing ad valorem taxes, river basin boards and local governments.

EXPECTED BENEFITS:

Improved shoreline habitat and water quality and associated increases in fisheries.

MONITORING ENVIRONMENTAL RESPONSE:

Existing bay monitoring programs will track trends in water quality and habitats. Environmental response also may be assessed by monitoring group permits for shoreline enhancement.

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REGULATORY NEEDS:

Possible amendments to state statutes governing dredge and fill activities.

RELATED ACTIONS:

SW-1, BH-1

Improve Compliance with and Enforcement of Wetland Permits

BH-7

ACTION:

Improve compliance with and enforcement of permits governing wetland mitigation by establishing level-of-service targets, providing periodic performance assessments, and continuing efforts to coordinate permitting and enforcement staff to provide greater continuity in oversight.

BACKGROUND:

State rules regarding mitigation for wetland impacts have been developed to offset wetland losses. However, a study of mitigation compliance completed by the Florida Department of Environmental Regulation — now Florida Department of Environmental Protection (FDEP) — in 1992 concluded that the majority of mitigation projects had either never been constructed or failed to comply with the terms of their permit and did not function properly. The generally low success rate statewide has been largely attributed to staffing shortfalls and organizational structures that have traditionally segmented rather than integrated permitting, compliance monitoring and enforcement functions. Without strong compliance monitoring and enforcement, regulated interests often have little incentive to perform compensatory mitigation in a manner consistent with the rules.

Wetland mitigation rules are administered by the FDEP, Southwest Florida Water Management District, and by local governments with delegated or legislative authority for wetland permitting.

Non-compliance with wetland mitigation permits in the Tampa Bay watershed has likely contributed to a net loss of both freshwater and tidal wetlands. However, documenting these trends has been extremely difficult because efforts to track compliance between and within various regulatory agencies have been inconsistent and lacking in sufficient detail. Inconsistent mitigation ratios, wetland delineation criteria, and design and performance standards have further complicated efforts to assess results.

Improving permit compliance will require that agencies focus first on recognizing and permitting effective mitigation designs, as well as increasing inspections during and after construction, and following up to promote better project maintenance by regulated interests. Access to mitigation sites also is a factor. In this regard, locally administered programs may have an advantage over state or regional programs, although the costs of absorbing these additional responsibilities may be an obstacle.

The state's new Environmental Resource Permitting (ERP) program, which consolidates existing wetland resource, management and storage of surface waters, and sovereign lands regulatory programs into a single permitting function, is expected to improve compliance monitoring and enforcement by increasing interagency coordination and reducing inconsistencies and duplication. Implementation of the ERP will create key opportunities for the consolidation and reorganization of these functions within regulatory agencies and participating local governments, and the creation of

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uniform standards for wetland delineation. Additionally, the Environmental Protection Commission (EPC) of Hillsborough County is currently developing a Memorandum of Understanding with SWFWMD which will allow EPC to conduct all wetland compliance and enforcement tasks within Hillsborough County. This agreement would result in more timely and consistent reviews of mitigation projects, while eliminating duplication of services and the potential for conflicting compliance criteria.

STRATEGY:

The strategy to improve wetland permit compliance monitoring and enforcement focuses on establishing level-of-service targets, continued implementation and periodic assessment of integrated permitting concepts advanced through the ERP program, and evaluation of existing staffing and funding resources and needs as the basis for recommendations for action. This strategy also calls for standardization of monitoring and reporting requirements within and between enforcing agencies and municipalities.

- STEP 1** Conduct a workshop to establish level-of-service targets for wetland permits (performance criteria and monitoring requirements) and compliance monitoring and enforcement within the Tampa Bay watershed, and assess associated staff and funding needs. In establishing level-of-service targets, participants should explore how principles of ecosystem management — which emphasize overall environmental benefits to the watershed — can be integrated into permitting and compliance programs. Additionally, they should evaluate ways to standardize reporting and monitoring methods between and within agencies.

Recommendations of actions to improve compliance monitoring and enforcement shall be submitted by the group to the Tampa Bay NEP by September 1997.

Responsible parties: FDEP and SWFWMD (to organize workshop); participants to include U.S. Army Corps of Engineers (USACOE), EPC, U.S. Fish & Wildlife Service (USFWS), Florida Game and Fresh Water Fish Commission (FGFWFC), and local governments requiring mitigation through local permitting or seeking delegated authority for wetland permitting

- STEP 2** Expand agency and local government permitting staff training and regular retraining to increase the emphasis on recognizing quality wetland mitigation designs as a first step to ensure that quality projects are permitted. The FDEP's statewide mitigation coordinator may be able to assist in organizing regular regional training seminars.

Responsible parties: FDEP and SWFWMD, USACOE, EPC, USFWS, FGFWFC, applicable local governments

- STEP 3** Continue to integrate permitting and compliance monitoring and enforcement functions in an effort to maximize efficiency and provide "cradle to grave" permit oversight, in which the same personnel that conduct permit reviews also are responsible for compliance follow-up. Also, encourage interagency compliance monitoring teams where feasible, including federal agencies.

Responsible parties: FDEP, SWFWMD, EPC, USFWS, FGFWFC, applicable local governments

- STEP 4 Based on recommendations from Step 1, standardize mitigation success criteria as well as monitoring and reporting requirements for created and restored wetlands.

Responsible parties: FDEP, SWFWMD, EPC, USFWS, FGFWFC, applicable local governments

- STEP 5 Assess the effectiveness of efforts to improve compliance monitoring and enforcement in the Tampa Bay watershed, including progress toward level-of-service targets (particularly compliance rates), results of integrating staff to assist in these efforts, and associated costs to agencies and applicants. Results of the assessment should be reported in the Tampa Bay NEP's Biennial Environmental Monitoring Report and the Agency on Bay Management's State of the Bay report.

Responsible parties: FDEP, SWFWMD, EPC, USFWS, FGFWFC, applicable local governments

SCHEDULE:

A preliminary "scope" for the workshop is requested by May 1997. Recommendations from the workshop are due September 1997. Implementation of Steps 3 and 4 can begin in 1997.

COST:

Only staff time is anticipated in the implementation of this strategy, although recommendations from Step 1 may call for additional resources or changes in existing allocations. For instance, additional training of wetlands permitting and enforcement personnel is estimated at \$50,000 a year for the first five years of the program, and \$25,000 after that.

EXPECTED BENEFITS:

Improved permit compliance monitoring, enforcement and reporting.

MONITORING ENVIRONMENTAL RESPONSE:

See Step 5.

REGULATORY NEEDS:

Improved coordination of permitting, compliance and enforcement can be accomplished without rule revisions.

RELATED ACTIONS:

N/A

BH-7

BH-8

ACTION PLAN

Bay Habitats

Expand Habitat Mapping and Monitoring Programs

ACTION:

Ensure implementation of adequate habitat mapping and monitoring programs to track trends in areal extent and quality of seagrass, mangroves, coastal marshes and oligohaline habitats in Tampa Bay over time.

BACKGROUND:

A critical element of the bay's management plan is the establishment and maintenance of a monitoring program to measure progress toward meeting the goals of the Tampa Bay National Estuary Program (NEP). This is very important to the local and state governments implementing actions, since counties, cities and state agencies must have adequate information to evaluate whether efforts spent on pollution abatement or other changes in the watershed are reflected in improvements in bay quality. Monitoring of habitats is also necessary to track progress toward reaching long-term restoration and protection goals set by the program, and provide essential information that can be used to redirect and refocus the plan.

One of the first efforts of the Tampa Bay NEP was to initiate a multi-year effort to develop a baywide monitoring program capable of reliably measuring changes in bay quality. This plan incorporates and expands on existing programs where possible, and consists of seven major elements: water quality, benthic, seagrass, bay scallop, fisheries, coastal marshes and mangroves, and oligohaline habitats.

This action ensures implementation of habitat monitoring elements defined in the baywide monitoring plan.

STRATEGY:

STEP 1 Continue the existing Southwest Florida Water Management District-Surface Water Improvement and Management (SWFWMD-SWIM) monitoring program mapping areal extent of seagrass in Tampa Bay to track trends in areal extent and progress toward restoration goals.

The extent of seagrass coverage in all areas of Tampa Bay is currently being monitored by SWFWMD-SWIM every two years. To date, no permanent funding source for the mapping program has been identified.

Responsible parties: SWFWMD

STEP 2 Implement the Seagrass Conditions Monitoring Program as developed by the Tampa Bay NEP Technical Advisory Committee. Hillsborough County monitors seagrass conditions in Cockroach Bay, and Pinellas County conducts seagrass monitoring in Fort DeSoto Park to track rates of seagrass

scarring. The City of Tampa conducts seagrass quality monitoring in Hillsborough Bay.

SWFWMD-SWIM is conducting the second year of the Seagrass Conditions Monitoring Program throughout the bay as a pilot project. Potential entities responsible for conducting biannual seagrass conditions monitoring in upcoming years remain to be identified.

Responsible parties: SWFWMD, Florida Department of Environmental Protection-Florida Marine Research Institute (FDEP/FMRI)

BH-8

- STEP 3** Continue existing annual benthic monitoring through 1996. Evaluate results of the four-year baseline in 1997 and redirect the program as appropriate. In 1996, sediment toxicity was added to the benthic community and sediment chemistry analyses.

Responsible parties: Hillsborough, Pinellas and Manatee counties

- STEP 4** Develop and implement a monitoring program to track habitat quantity and quality in coastal marshes, oligohaline habitats and associated uplands, as well as restored habitats.

Development of these elements of the habitat monitoring program will be initiated as part of the habitat restoration and protection master plan. This plan will identify responsible entities for implementation.

Responsible parties: SWFWMD-SWIM is currently monitoring some of these elements. Other responsible parties may include FDEP, the Florida Game and Fresh Water Fish Commission, and local governments.

- STEP 5** Report results and integration of environmental monitoring programs to bay managers on a regular basis, to allow for redirection and refocus of management programs as necessary.

The first Biennial Environmental Monitoring Report (BEMR) was released in 1996. Local monitoring groups evaluated progress toward implementing the baywide monitoring program in the fall of 1996. Each ongoing monitoring program is responsible for the development of a summary chapter in the BEMR. An integral element of the report will be the bay managers' summary, which will contain an integrated analysis of conditions and trends in Tampa Bay. Areas of the bay that show signs of degradation or improvement will be noted in the bay managers' summary, to allow for changes in management actions as warranted.

Responsible parties: initial effort part of a 1995 Tampa Bay NEP project. The long-term coordinator for production of the report has not yet been determined.

SCHEDULE:

Steps 1 and 3 are ongoing. Implementation of Step 4 began in 1996. The first biennial monitoring report was produced in October 1996 as part of an ongoing Tampa Bay NEP project.

ACTION PLAN

Bay Habitats

COST:

- Seagrass mapping: \$40,000 every two years for update
- Seagrass quality: \$36,000 every two years
- Estimated marsh/mangrove/coastal upland mapping: \$120,000 for true color and color infrared baseline maps; \$45,000 every two years for update
- Benthic monitoring: \$150,000 annually (\$115,000 from Hillsborough County, \$19,000 from Pinellas County and \$16,000 from Manatee County)
- Estimated marsh/mangrove/coastal upland quality: \$40,000 every two years
- BEMR: Production, printing and distribution costs every two years, estimated at \$10,000.

EXPECTED BENEFITS:

Implementation will provide adequate information to track trends in habitat extent and quality, and will provide managers with an "early warning system" to detect areas that may need additional management action.

MONITORING ENVIRONMENTAL RESPONSE:

Results of all bay monitoring programs will be included in the BEMR.

REGULATORY NEEDS:

None anticipated

RELATED ACTIONS:

BH-1, BH-2, BH-5

FRESHWATER INFLOW

Maintaining an adequate supply of fresh water to Tampa Bay and its tributaries is crucial to preserving the bay's health. This is especially important for rivers impounded by dams that drastically restrict those flows at certain times of the year.

FI

The bay's four major rivers and numerous smaller tributaries provide critical low-salinity habitats to dozens of species of fish and shellfish at important stages in their development. They are the primary nursery habitat for red drum, snook and striped mullet. While these dynamic habitats tend to be small, they may support many thousands of juvenile fish each year. As these fish mature, they typically move to more saline areas of the bay or out into the Gulf of Mexico, although some species return to these rivers during various seasons.

These vital ecosystems have declined as dams and development have altered the amount and timing of freshwater inflows to the bay. Additionally, many smaller creeks and streams that once served as nurseries to fish have now been channeled, filled or altered through development.

The area's largest dams, on the Hillsborough and Manatee rivers, release almost no water downstream during peak periods of the dry season; annually, they retain about 35 percent and 29 percent of their respective up-river flows for drinking, irrigation and industrial uses.

Local water supply development plans may further restrict the flow of fresh water into already impacted tributaries and bay segments. For example, the Tampa Water Resource Recovery Project would remove up to 50 million gallons per day (mgd) of fresh water currently discharged from the City of Tampa's sewage treatment plant, and possibly reduce flows to the Tampa Bypass Canal and McKay Bay. However, the project also would remove a significant source of excess nitrogen from the bay. Additionally, the West Coast Regional Water Supply Authority plans to remove 7 mgd from the Alafia River during the first phase of its 1995 Water Resource Development Plan (1995-2000).

Legislation passed in 1996 requires the Southwest Florida Water Management District (SWFWMD) to establish minimum flow requirements for priority surface waters in the northern Tampa Bay area by October 1, 1997. The District already had been working on a priority list, which includes the lower reaches of the Hillsborough River/Tampa Bypass Canal. An evaluation of the cumulative environmental impacts associated with the Tampa reuse project will be conducted as part of the effort to establish minimum flows for the Hillsborough River.

Recent studies show little overall change in the amount of fresh water entering the bay proper since the 1950s, because declines in natural flows have been partially countered by steady increases in stormwater runoff from the watershed. But some significant changes have occurred upstream in the low-salinity zones favored by the young of many of the bay's most popular fish. Declines here and associated declines in fisheries make preservation and restoration of remaining low-salinity habitats vital.

ACTION PLAN

Strategies to preserve and restore Tampa Bay's freshwater tidal streams are addressed in the Tampa Bay NEP's master plan for habitat restoration, which was finalized in 1996 (see BH-1). The following action focuses on establishing seasonal freshwater inflows to the bay from rivers impounded by dams.

GOALS FOR FRESHWATER INFLOW

- Maintain optimal freshwater inflows to Tampa Bay and its tributaries.
- Establish and maintain minimum seasonal freshwater inflows for rivers impounded by dams: Hillsborough River, Manatee River, Braden River and Palm River.

ACTION TO ADDRESS FRESHWATER INFLOW

- FI-1 Establish and maintain minimum seasonal freshwater flows downstream of dams.

Establish and Maintain Minimum Seasonal Freshwater Flows Downstream of Dams

ACTION:

While safeguarding water supply and flood control functions, establish and maintain minimum seasonal freshwater inflows downstream of dams on the Hillsborough, Manatee and Braden rivers, and below Control Structure S-160 on the Palm River, to restore and preserve the biological productivity of the estuary's critical juvenile fisheries habitats.

BACKGROUND:

Estuaries, where fresh water and salt water mix, are highly productive natural habitats for fish and other marine life. The juveniles of many aquatic species, including spotted seatrout, snook, red drum and tarpon, depend on the low- and medium-salinity portions of these shallow waters, especially in the tidal sections of rivers and streams. However, the productivity of these habitats as nurseries and feeding areas depends largely on maintaining an adequate supply of fresh water upstream at certain times of the year.

In this region, potable water for drinking, irrigation and industrial uses comes from reservoirs and from groundwater sources. Demand for fresh water in the tri-county area is expected to increase from 544 million gallons per day (mgd) in 1990 to 765 mgd in 2020, according to Southwest Florida Water Management District (SWFWMD).

Florida Statutes Section 373.042 (1991) directs the state's water management districts to establish "minimum flows" for watercourses and "minimum levels" for surface waters and aquifers. The statute defines minimum flows as the limits at which further withdrawals would be "significantly harmful to the water resources or ecology of the area." Legislation passed in 1996 requires the District to set minimum flows for priority surface waters in the northern Tampa Bay area by October 1, 1997.

Minimum flows based on river ecology have not yet been set for the Hillsborough, Palm and Braden rivers. A preliminary minimum flow of 0.425 cubic feet per second (cfs) — or roughly 275,000 gallons per day which is the current estimated leakage from the dam — was set for the Manatee River in 1991. The flow's adequacy is now being examined by SWFWMD in cooperation with Manatee County.

Minimal flows were not required when control structures were constructed on the Hillsborough, Palm, Braden and Manatee rivers (all prior to 1972). Nevertheless, a series of ongoing and recently completed studies should provide SWFWMD with sufficient information to set thresholds for each river to protect the productivity of the river and the bay downstream of the dams.

A minimum flow study is not planned for the Alafia River because the SWFWMD Needs and Sources Study concluded that water supplies were not needed from the

FI-1

FI-1

ACTION PLAN

Bay Habitats

Alafia for the 1990-2020 planning horizon. However, the West Coast Regional Water Supply Authority (WCRWSA) has recently proposed to remove 7 mgd of fresh water from the Alafia in the first phase of its 1995 Water Resource Development Plan (1995-2000).

Studies on the Braden, Hillsborough, Manatee and Little Manatee rivers, and the Tampa Bypass Canal, have addressed various aspects of river flow and ecology. Evaluation of these studies will provide vital information in establishing minimum flow requirements.

STRATEGY:

This action is to evaluate and set minimum seasonal freshwater inflows to Tampa Bay from rivers impounded by dams to protect the ecological integrity of vital downstream fisheries habitats.

STEP 1 Conduct technical workshops for each impounded river to evaluate results of freshwater studies and develop recommendations for minimum freshwater flow requirements.

At the request of SWFWMD, the Tampa Bay NEP convened an advisory committee in October 1996 to assist in establishing flow requirements for the Hillsborough/Palm River system by October 1997.

NEP also sponsored an initial workshop on the Manatee River in August 1995, which included local government and agency representatives, scientists, engineers, utilities and community interest groups.

In evaluating available studies, participants are considering:

- whether flows to the downstream portions of impounded rivers have been quantified
- if appropriate flows to restore and maintain critical low-salinity habitats can be determined from the studies
- the impacts of various flow-release scenarios on public water supplies and economic development.

Responsible parties: Tampa Bay NEP, SWFWMD and local governments

STEP 2 Establish seasonal flow requirements by the state-mandated deadlines for the Hillsborough, Palm, Manatee and Braden rivers, incorporating recommendations from advisors in Step 1 and considering other socio-economic and environmental factors.

Responsible parties: SWFWMD

STEP 3 Implement minimum seasonal flows. Implementing parties may evaluate various options for meeting minimum flow requirements, including water conservation to reduce demand on impounded water; augmentation of well-fields or reservoirs with highly treated wastewater or stormwater, as long

as public health concerns are addressed; and relocating point source discharges to augment freshwater flows downstream of dams.

Responsible parties: *local governments, WCRWSA*

- STEP 4** Monitor the environmental response. Develop and implement a program to determine spatial and temporal changes in water quality and in-stream biology in response to these limits, perhaps by expanding local government water quality and benthic monitoring programs to address these monitoring needs.

Responsible parties: *To be determined (possibly permit applicant)*

FI-1**SCHEDULE:**

Ecological assessment studies are now being conducted as a permit condition for water use withdrawals. SWFWMD will evaluate withdrawal rates and recommended minimum flows for each river according to the following state-mandated schedule:

Hillsborough River/Palm River	October 1, 1997
Manatee, Little Manatee and Braden rivers	1999

COST:

Steps 1 and 2 require administrative and staff time. Associated studies are financed by the local governments seeking permits for water withdrawals. Costs to comply with seasonal minimum flows (Step 3) will depend on the minimum flow established. One basis for cost analysis is to compute the cost and yield for various alternative sources of water, such as construction of a new reservoir, to replace the amount of additional water released downstream.

For example, Manatee County residents now pay about \$1.62 per 1,000 gallons to have water delivered to their homes, which includes reservoir and treatment costs and a Readiness to Serve charge. To meet a 5.0 cfs freshwater flow (up from 0.425 cfs) from the existing dam would require new alternative potable water sources, with costs ranging from an additional \$.08 per 1,000 gallons for construction of a new reservoir at Gilley Creek to nearly \$.80 per 1,000 gallons for development of an off-stream reservoir. Both options would increase potable yields, in addition to allowing more water over the dam to sustain the biological needs of downstream ecosystems.

For the average Manatee County household, which uses roughly 6,500 gallons per month indoors, the Gilley Creek option would increase monthly water bills by about 4.9 percent or \$0.52 per month. For the off-stream reservoir option, monthly water bills would rise 49 percent or an additional \$5.14 per month.

The costs to monitor the environmental response to minimum flows have not yet been finalized. However, Manatee County estimates that it currently spends about \$100,000 per year to monitor water quality downstream of the reservoir, about half of the county's annual bay monitoring expenditure.

ACTION PLAN

Bay Habitats

EXPECTED BENEFITS:

Establishing and maintaining appropriate freshwater inflows to the bay from rivers impounded by dams will restore and protect vital fisheries habitat downstream of those control structures. Low-salinity portions of these tributaries are vital nursery areas for several species of fish, including red drum and snook.

MONITORING ENVIRONMENTAL RESPONSE:

Ongoing fisheries, water quality and benthic monitoring programs (summarized in Monitoring Bay Improvement) provide an overall assessment of the environmental quality of the bay and its tributaries. Water flows or release rates are recorded by Manatee County at the Lake Manatee dam on the Manatee River, and by the City of Bradenton at the Evers Reservoir dam on the Braden River. SWFWMD records flow at the Tampa Bypass Canal (Palm River), and the U.S. Geological Survey (USGS) records flow at the Hillsborough Reservoir dam.

Monitoring to detect environmental responses to new freshwater inflows set as a result of this action may be required as a condition for the renewal of water use permits.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

BH-1, WW-1



*Mrs. Lemuel R. Woods
with a tarpon she caught
in Tampa Bay (1920)*

PHOTO: BURGERT BROTHERS

Fish & Wildlife

Efforts by the Tampa Bay National Estuary Program (NEP) to protect and enhance Tampa Bay's diverse fish and wildlife resources focus primarily on establishing healthy environments through improvements in water quality and habitats. But increased enforcement of existing regulations to limit physical impacts associated with fishing, boating, and foot traffic in bird rookery areas also is a priority.

Hundreds of species of marine and terrestrial animals rely on Tampa Bay and the rich tapestry of environments it provides. Mangrove islands in Tampa Bay are among the most productive nesting sites in the nation for birds such as the brown pelican, roseate spoonbill, white ibis and reddish egret. As many as 40,000 pairs of birds nest each year on these islands, which support two of the state's five largest brown pelican colonies. Other birds, such as the American white pelican and several species of sand-piper, are seasonal visitors to the bay.

Tampa Bay also attracts as many as 200 endangered manatees during the winter months, when the gentle marine mammals gather at the warm-water plumes discharged by the power plants bordering the bay. About 50-100 of these gentle giants are year-round residents. Manatee mortality has tripled in Tampa Bay from an annual average of about four (from 1976-1985) to more than 12 (from 1990-1994). Boating collisions and propeller strikes claimed about 20 percent of the 61 manatees that died in the bay during this last four-year period.

ACTION PLAN

Bay Fish & Wildlife

Three species of sea turtles — loggerhead, green and Kemp's ridley — feed in the bay, and as many as 500 bottle-nose dolphins reside here year-round. Like the manatee, these larger marine creatures are threatened by accidental boat strikes and ingestion of and entanglement by marine debris, particularly monofilament fishing line.

The bay's once plentiful supplies of fish and shellfish have declined in recent decades, a result of habitat loss and historic declines in water quality as well as pressures from overharvesting. Recent bans on purse seines and gill nets are expected to sharply reduce commercial harvesting of some species, such as spotted seatrout. While a precise figure of the historical decline is difficult to estimate, fisheries landings data show that the amount of bay finfish brought to market at local ports in Hillsborough and Pinellas counties decreased by more than 24 percent between 1966 and 1990, from 4.8 million pounds to 3.7 million pounds.

Records going back even further, to 1950, show that catches of spotted sea trout declined by 86 percent by 1990, from 487,000 pounds to 67,000 pounds. Similarly, red drum harvests between 1950 and 1986 plummeted by 81 percent, from 80,000 pounds to 15,000 pounds, although these raw landings data do not reflect changes in fishery management or quotas. Loss of seagrass habitat and overharvesting are suspected in the decline of these popular sportfish.

Recent water quality gains and associated seagrass recovery have made some bay managers hopeful that the bay may again support scallops, which disappeared from these waters more than three decades ago. While scientists can't pinpoint the cause for the collapse of the local population, they suspect declining water quality was to blame. Stocking efforts designed to jump-start a self-sustaining scallop population are now underway, primarily in the lower portions of the bay where seagrasses and salinities are most favorable.

Preserving Tampa Bay's rich fish and wildlife bounty will require continued focus on water and sediment quality, improved enforcement to minimize impacts to habitats and wildlife, and restoration and protection of habitats and food sources.

MANAGEMENT OBJECTIVES

- Increase the number, diversity and health of the bay's fish and shellfish populations, and restore a self-sustaining bay scallop population.
- Restore and protect wildlife habitats and food sources, and promote regional wildlife habitat planning.
- Minimize physical impacts to bay wildlife and habitats.

SUMMARY OF ACTIONS FOR FISH & WILDLIFE

- FW-1 Increase on-water enforcement of environmental regulations.
- FW-2 Establish and enforce manatee protection zones.
- FW-3 Support bay scallop restoration.
- FW-4 Assess the need to investigate the cumulative impacts of power plant entrainment on bay fisheries.
- FW-5 Continue and expand the Critical Fisheries Monitoring Program.

[Note: Many of the strategies to support fisheries and wildlife focus on water quality and bay habitats. Please refer to the bay Action Plans addressing Water Quality and Bay Habitats for these related actions.]

FW

Increase On-Water Enforcement of Environmental Regulations on the Bay

ACTION:

Increase enforcement of environmental regulations on Tampa Bay by obtaining support for increased allocation of Salt Water Fishing License revenues to marine law enforcement.

BACKGROUND:

Efforts by the Tampa Bay National Estuary Program (NEP) to protect Tampa Bay's diverse fish and wildlife resources have focused largely on establishing optimum water quality and habitat environments. But increased enforcement of existing environmental regulations to minimize impacts associated with fishing, boating and foot traffic in bird rookeries is also a key priority of the Program's strategic blueprint for the bay.

When the Salt Water Fishing License Rule was enacted by the state in 1989, anglers and local communities alike expected it to be a boon for local marine enforcement. The rule was established to identify and collect a user fee from saltwater anglers for the conservation and management of fishery resources. It stipulates that marine research and marine enhancement/habitat restoration shall each receive not less than 30 percent of the revenues collected, and that no more than 30 percent be allocated for marine law enforcement. Remaining revenues are split among the Marine Fisheries Commission (2.5 percent), administration (5 percent), and a state environmental education trust fund (2.5 percent).

In fact, statewide allocations for marine enforcement have averaged about 20 percent over the past five years, which is two-thirds of the 30 percent maximum allowed by law and anticipated by many supporters of the bill. Despite allocations statewide, five fewer marine patrol officers are assigned to the Tampa Bay district today than when the rule was enacted in 1989. In the first few years the license fees were collected, most of the revenues allocated to marine law enforcement were spent on capital outlay expenditures such as boats and vehicles. However, with those needs now addressed, it is possible that more of the revenues dedicated to law enforcement may be used to hire additional personnel.

Overall, the state has collected more than \$68 million since the Salt Water Fishing License Rule was enacted. Of \$11.8 million in revenues collected from saltwater fishing licenses and special stamps statewide in FY 93-94, about 17 percent or \$2.3 million was allocated by the Florida Department of Environmental Protection (FDEP) to the Florida Marine Patrol (FMP) for statewide law enforcement. It is not known how much of that allocation came back to the Tampa Bay region (FMP, District IV*), which contributed more than \$1.4 million in revenues that year.

District IV's budget has increased by only about 5 to 10 percent annually since the passage of the rule, mostly to compensate for increasing fuel prices, and declined in

FY 94-95. Requests for additional Marine Patrol officers have not been granted. Some suspect that general revenues for the Florida Marine Patrol have been depleted as saltwater fishing license revenues have been established — a “lottery syndrome” that results in few or no net increases in available funding to address resource needs.

The FMP, a part of the state’s Division of Law Enforcement, enforces state saltwater fishing regulations, boating safety rules and other wildlife and habitat protection measures. It also is the first line of defense in emergencies such as marine accidents and hurricanes, and employs a select number of special environmental enforcement officers to investigate land-based environmental crimes such as illegal dumping.

Enforcement needs are growing on Tampa Bay, which has one of the lowest ratios of marine patrol officers per registered boats — only one or two officers per shift per county for nearly 100,000 registered recreational boats. Local municipal marine enforcement units (financed in Hillsborough, Pinellas and several other counties by local boater registration add-on fees) pick up the slack in some areas, but cannot provide the coverage needed to effectively monitor the 400-square-mile bay and adjoining Gulf coastline, according to local Marine Patrol officials. Enforcement needs have increased further with the recent passage of the marine net ban.

* District IV, which includes Tampa Bay and Sarasota Bay, stretches north to Levy County, south to Sarasota County and east to Polk and Highland counties.

STRATEGY:

This strategy calls for a review of Salt Water Fishing License revenue expenditures for marine law enforcement to secure additional marine patrol officers for Tampa Bay, and possible revisions to the state Salt Water Fishing License Rule to require a minimum allocation for marine law enforcement.

STEP 1 Conduct a workshop to review allocations and expenditures of Salt Water Fishing License revenues, as well as general revenue and other related expenditures by the FDEP marine law enforcement division statewide. The workshop should explore alternatives for increasing enforcement spending — including a reallocation of Salt Water Fishing License revenues — and involve representatives of the FDEP in Tallahassee, the Agency on Bay Management (ABM) and other interested parties.

Responsible parties: *Tampa Bay NEP, FDEP, ABM*

STEP 2 Depending on the results of the workshop, pursue options for increasing environmental enforcement capabilities in Tampa Bay. If a reallocation of Salt Water Fishing License revenues is deemed the best solution, NEP may consider a formal legislative request to require that a minimum percentage of Salt Water Fishing License revenues be directed to marine law enforcement.

Responsible parties: *ABM, Tampa Bay NEP, FDEP*

STEP 3 Explore partnerships between the FMP and boat manufacturers to provide new boats to new marine officers to help maximize available dollars for

FW-1

ACTION PLAN

Bay Fish & Wildlife

marine enforcement.

Responsible parties: Tampa Bay NEP, FDEP/FMP, boat manufacturers

- STEP 4** Continue to monitor Salt Water Fishing License revenues to ensure an equitable distribution of proceeds as outlined in the original legislation. Monitoring information could be included in the Tampa Bay NEP's Biennial Environmental Monitoring Report and the ABM's annual State of the Bay report.

Responsible parties: FDEP, ABM, Tampa Bay NEP

SCHEDULE:

All steps will be initiated in 1997.

COST:

This action stresses a reallocation of existing funds, rather than new expenditures, to address environmental enforcement needs.

EXPECTED BENEFITS:

Increased enforcement of the bay's fisheries and environmental regulations will improve protection of fish and wildlife, as well as the habitats they depend upon. Efforts to bolster enforcement also send a message to resource users and anglers that existing regulations are important, and that the quality of the public's natural resource won't be sacrificed for the illegal actions of a few.

MONITORING ENVIRONMENTAL RESPONSE:

FMP can provide information annually on enforcement actions and associated benefits to the resource. District IV is encouraged to provide this information in the State of the Bay report published annually by the ABM. Additionally, information on Salt Water Fishing License revenues, and local allocations, can be included in the Biennial Environmental Monitoring report of the Tampa Bay NEP.

REGULATORY NEEDS:

Possible revisions to the state Salt Water Fishing License Rule.

RELATED ACTIONS:

FW-2, BH-3

* Revenue and salt water fishing license data provided by FDEP, August 1995

Establish and Enforce Manatee Protection Zones

FW-2

ACTION:

Enact local ordinances designating manatee protection zones in Tampa Bay.
Encourage the use of boat propeller guards throughout the bay.

BACKGROUND:

Research continues to bolster evidence that Tampa Bay is an important year-round or seasonal home to many imperiled manatees, which are protected under the federal Endangered Species Act. In fact, as many as 200 of the more than 2,600 manatees remaining in the state seek refuge in the winter at the warm-water discharges surrounding the bay's power plants. Additionally, the bay's seagrass meadows and numerous natural and manmade freshwater sources provide critical feeding and gathering areas for manatees throughout the year.

Although several no-wake areas were established in the bay for boater safety, only one — a protected area in St. Petersburg's Coffeepot Bayou — was created primarily to protect manatees. However, many communities are using boater safety zones for manatee protection.

Increases in manatee deaths associated with propeller strikes or collisions reinforce the need for more protective measures in Tampa Bay. Manatee deaths in Tampa Bay and adjacent coastal waters have risen from an average of 4.1 manatees a year between 1976 and 1985, to an average of 10.1 manatees a year from 1986 to 1994. Of the 164 manatee deaths verified in the bay area from 1976 through March 1996, 34, or 21 percent, died from collisions with watercraft.

Manatee researchers with the Florida Marine Research Institute (FMRI) have identified several areas of the bay where manatees would benefit from increased protection, based on the best available manatee population and distribution data. The areas are important as either winter refuges from cold water, seagrass feeding areas, sources of fresh water or migration routes. Among these sites are:

- warm-water outfalls of Tampa Electric Company's Big Bend power plants (winter sanctuaries)
- the warm-water outfall of Florida Power Corporation's Bartow power plant (winter sanctuary) and adjacent seagrass beds near Weedon Island (feeding area)
- Culbreath Bayou in Tampa (seagrass beds and freshwater source)
- Anna Maria Sound near Perico Island (seagrasses)
- lower Manatee River near Palmetto (fresh water and seagrasses)
- upper Braden River near Bradenton (freshwater source)

- Hillsborough River near Sulphur Springs (fresh water)
- portions of Terra Ceia Bay
- portions of McKay Bay (seagrasses)
- the mouth of the Little Manatee River up to E.G. Simmons Park (seagrass beds)
- the Rocky Point area, southwest side of the Courtney Campbell Causeway (seagrass beds)

A joint meeting of the Tampa Bay NEP and the Agency on Bay Management (ABM) was held in November 1996 to discuss the justification and ramifications of establishing manatee protection zones in Tampa Bay. Participants concluded that a formal workgroup composed of environmental officials, manatee researchers and other interested parties should be created to develop specific recommendations.

Designation of manatee protection zones could be done unilaterally by local governments, or in conjunction with rules developed by the Florida Department of Environmental Protection (FDEP). Creation of zones by local ordinance is generally faster than the state rulemaking process and should be pursued first, followed by state adoption if necessary. Once designated, maximum boating speeds and entry restrictions would be put into place for the zones. The limits might require boaters to travel at idle speeds year-round within the zones, and forbid boat entry entirely during certain times of the year such as winter, when large numbers of manatees congregate in just a few small areas. The restrictions would be periodically re-evaluated and adjusted as needed, based on updated manatee population data. Consequently, continued research into manatee movements, habitat requirements and mortality should continue.

The Florida Marine Patrol (FMP) and local marine law enforcement units would enforce the restrictions in the manatee zones. However, the amount of money allocated to FMP activities in the Tampa Bay area currently is not sufficient to ensure adequate enforcement, thus this action also proposes investigating sources of additional funding for the FMP. Possible sources include a local boater registration add-on fee (already in place in Pinellas and Hillsborough counties) or a reallocation of revenues from the state Salt Water Fishing License. (See FW-1 for a more extensive discussion of these options.)

Enforcement also could be enhanced through public education, as well as citizen monitoring and reporting of speed violations.

Recognizing that manatees travel great distances and will not always remain within the protected zones, this action also encourages boaters to install special cage-like guards on their propellers to avoid causing propeller injuries to manatees throughout Tampa Bay. These guards, which now are manufactured commercially and cost about \$100 each, also can protect the bay's seagrasses from propeller damage and reduce human injuries from boat propellers. Newer prop guard models have made substantial progress in resolving concerns about boat performance, and the FDEP's Bureau of Protected Species Management has budgeted money in FY 97-98 to test the various models on the market.

STRATEGY:

- STEP 1** Establish a workgroup to explore recommendations for establishing manatee protection zones in Tampa Bay. The workgroup's members should include environmental officials, manatee researchers and representatives from environmental and boating clubs, as well as boat manufacturers. The workgroup should submit recommendations to the NEP Policy Committee by September 1997.
Responsible parties: Tampa Bay NEP, ABM, FDEP
- STEP 2** Implement recommendations from Step 1, including adoption of zones through local ordinances and installation of signs denoting protection areas.
Responsible parties: FDEP, local governments,
- STEP 3** Increase funding for the FMP in Tampa Bay (see Action FW-1) and local law enforcement marine units to ensure adequate enforcement of boating speed and entry restrictions within the manatee protection zones. Among the possible revenue sources are a local boater registration add-on fee, or reallocation of state Saltwater Fishing License fees.
Responsible parties: Local governments, Florida Legislature (for Salt Water Fishing License revenues)
- STEP 4** Organize and train qualified volunteers to monitor and report speed or entry violations within the protection zones. Volunteers also could assist with monitoring new zones to gauge the effectiveness of the restrictions.
Responsible parties: FDEP, working with local environmental action groups such as Tampa BayWatch and the FMP's Coast Watch program.
- STEP 5** Continue ongoing manatee population and mortality studies in Tampa Bay. Reassess justification for the protection zones periodically based on monitoring data to determine the need for changes.
Responsible parties: FDEP/FMRI
- STEP 6** Promote the use of propeller guards to avoid injuring manatees throughout Tampa Bay.
Responsible parties: Tampa BayWatch, Florida Conservation Association, local boating and environmental groups and fishing clubs

SCHEDULE:

Steps 1-4 can be initiated in 1997, with appropriate rulemaking and financing in place in 1998. Step 6 also can be initiated in 1997, with demonstrations of the propeller guards to various boating and fishing groups. Step 5 is an ongoing project that should continue indefinitely.

FW-2

ACTION PLAN

Bay Fish & Wildlife

COST:

Designation of manatee protection zones would involve administrative and noticing requirements, as well as posting of designated areas. However, gaining public and boater support for designation of the zones and associated boating restrictions is expected to be a staff-intensive effort. Step 3 could be accomplished through a local boater registration add-on fee, or through a greater allocation of revenues from the state Salt Water Fishing License. Enforcement revenues also could be generated through legislative authorization of a law requiring local governments to transfer 25 percent of funds received in fines and penalties to the FDEP's FMP for those violations where arrests were made by FMP officers. The funds received from those transfers should be used exclusively for increasing enforcement capabilities of the FMP in the district generating the funds.

EXPECTED BENEFITS:

Designation of manatee protection zones will increase protection of manatees and vital seagrass habitats within Tampa Bay.

MONITORING ENVIRONMENTAL RESPONSE:

FDEP/FMRI currently monitors manatee abundance, distribution and mortality in Tampa Bay. These reports can be incorporated within the Tampa Bay NEP's Biennial Environmental Monitoring Report.

REGULATORY NEEDS:

Passage of local ordinances designating manatee zones. Legislative action also may be needed to ensure adequate funding for FMP and local enforcement of the restrictions.

RELATED ACTIONS:

FW-1, BH-3

Support Bay Scallop Restoration

ACTION:

Support bay scallop restoration by assisting stocking, spawning and monitoring efforts.

FW-3

BACKGROUND:

Improving water quality in Tampa Bay has created opportunities in the southern portion of the bay for recovery of the bay scallop, which all but disappeared from the bay in the 1960s. Experts suspect that water pollution was a key factor in the collapse of this highly sensitive species.

Studies by the Tampa Bay National Estuary Program (NEP) indicate that bay water quality has improved to levels necessary to support the reintroduction of this mollusk. However, stock sizes are so depleted that seeding is needed to jump-start a sustainable population.

To assist recovery, the Tampa Bay NEP has supported pilot projects by the University of South Florida (USF) to seed the bay with almost a quarter-million juvenile scallops raised in laboratories. Large seed stocks are necessary since natural predation and mortality of young scallops is high.

The Tampa Bay NEP also sponsored a study through the Florida Marine Research Institute (FMRI) to evaluate the effectiveness of existing stocking strategies. That study, completed in January 1996, indicates that current efforts can be successful, but must be continued for several years to compensate for variations in habitat quality and weather that may dramatically affect year-to-year scallop reproduction and survival. For example, an extensive red tide that plagued the Southwest Florida coast in 1995 adversely affected the survival of bay scallops that year.

Funding from the Program also supported the second phase of this project, which has allowed USF to seed an additional 100,000 juvenile scallops with the help of citizen volunteers. More than 50 waterfront residents in the southern portion of the bay have each adopted as many as 500 juvenile scallops, placed in "scallop condominiums" along docks until they spawn. A single adult may release as many as 500,000 eggs, but fewer than 5 percent are expected to survive to adulthood. Most adult bay scallops die shortly after spawning.

Other groups also are assisting in efforts to bring about return of the bay scallop. In August 1995, Tampa BayWatch directed a scallop air lift, with assistance from WFLA-TV, the Florida Marine Patrol and the Florida Conservation Association, transporting nearly 2,000 adult scallops by helicopter to Tampa Bay from the Steinhatchee River. This effort was repeated in 1996. The caged mollusks were placed at protected sites in Ft. DeSoto Park Aquatic Preserve where they could safely spawn. Another NEP-initiated project, the Great Bay Scallop Search, dispatches teams of snorkelers yearly to designated portions of the bay to look for live scallops produced

FW-3

as a result of the transplanting and seeding efforts. The most recent Scallop Search, conducted in September 1996 and sponsored by Tampa BayWatch, found 75 scallops in seagrass meadows within Boca Ciega Bay, Pinellas Point and Ft. DeSoto.

STRATEGY:

STEP 1 Identify funding sources to continue the scallop stocking program, which is directed by USF. The USF scallop laboratory is currently shut down due to lack of funding. Initial projects, which involved the seeding of almost 250,000 stock, and the placement of an additional 100,000 juvenile scallops at waterfront docks in the southern portion of the bay, have been completed.

Additional work would support placement of as many as two million lab-reared scallops annually in the bay over a period of about five years.

Responsible parties: Tampa Bay NEP, USF, FMRI

STEP 2 Monitor the bay to assess trends in scallop recovery. A study by FMRI researchers concluded that volunteer surveys such as the Great Bay Scallop Search are successful and should be continued, but an expanded monitoring program may be needed if scallop populations in the bay increase substantially.

Responsible party: Tampa BayWatch (for the Great Bay Scallop Search), FMRI

STEP 3 Fully evaluate the stocking program in Tampa Bay in 1999 to assess progress and initial efforts toward re-establishing a sustainable bay scallop population in the southern portion of the bay.

If a scallop population has not been re-established, and if monitoring and program evaluation fail to indicate a reasonable probability for success, determine whether the program should continue, or explore alternative techniques that may be more cost-effective. Provide recommendations to the Tampa Bay Management Board.

Responsible party: Tampa Bay NEP staff

SCHEDULE:

The first stocking project was accomplished in 1992-1993, followed by additional seeding of scallops in 1994-1995. Further stocking efforts are on hold pending funding availability. Monitoring of scallop populations and distribution began in 1994, and will continue yearly. A comprehensive evaluation of the success of the stocking program will be conducted in 1999.

COST:

Scallop costs for Phase 3, which is pending, are estimated at \$.05 each, which includes administrative support and overhead. Placing 2,000,000 scallops annually would cost about \$100,000. Costs for monitoring and program performance review are to be determined.

EXPECTED BENEFITS:

Recovery of this popular shellfish species, which depends on healthy seagrasses and favorable water quality conditions, may provide some of the most important evidence to date that Tampa Bay is on course to recovery.

MONITORING ENVIRONMENTAL RESPONSE:

The bay will be monitored to track population trends, and sightings and data from commercial fishermen will be incorporated. Evaluations will factor in appropriate recovery lag time for population recovery.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

BH-1, BH-3, BH-4

FW-3

Assess the Need to Investigate the Cumulative Impacts of Power Plant Entrainment on Bay Fisheries

ACTION:

Determine whether a comprehensive study to assess the cumulative impacts of multiple power plant operations on Tampa Bay fish populations is needed. If a study is warranted and shows cumulative adverse impacts, adjust plant operations and maintenance schedules as appropriate to reduce power plant entrainment.

BACKGROUND:

Currently there are five steam electric plants utilizing open-cycle cooling systems on Tampa Bay: Tampa Electric Company's (TECO's) Big Bend, Gannon and Hooker's Point facilities and Florida Power Corporation's (FPC's) Higgins and Bartow plants (FPC's Higgins Plant is not currently operating). Open-cycle, or once-through, cooling is the most economical method of condensing steam from the turbines of steam electric plants. However, the volumes of ambient bay water used for this purpose, and the quantities of waste heat added to the bay as a result, can be significant.

Although the discharge of heated bay water from the power plants into the subtropical Tampa Bay estuary produces temperature changes that have demonstrable impacts, according to a Florida Department of Environmental Protection (FDEP) study, another impact results from the capture of planktonic eggs and larval fish and shellfish in the cooling-water intakes of the power plants. This process, called entrainment, can lead to high rates of mortality from physical, chemical and thermal stress. Estimates from power plant monitoring in the early 1980s project that 274 billion fish eggs and 83 billion fish larvae are entrained annually in Tampa Bay. However, in the absence of sufficient baseline information on current stock sizes, natural survival rates and losses caused by habitat degradation, fishing pressure and other factors, it is extremely difficult to assess the impact of power plant entrainment on overall bay fisheries populations.

Under the current regulatory system, each power plant must obtain operating permits from the Environmental Protection Agency (EPA) and the FDEP. But the permit review process only examines the localized impacts of each individual plant, and only two of the bay's five power plants have been required to conduct extensive studies of their fisheries impacts under Clean Water Act regulations. The cumulative impacts of multiple facilities on the fish populations of the bay have not been evaluated or considered.

Conducting a comprehensive study of cumulative impacts is an expensive and lengthy task, and could be fraught with legal complications. There currently is no requirement in the state rules governing power plants that cumulative impacts be addressed, and initiating such a study in Tampa Bay may necessitate a rule change. Additionally, the unique nature of each facility's operating processes, along with a lack of suitable

background information on fish populations and the effects of other human-related impacts such as fishing, may make a study on entrainment inconclusive.

Finally, the cost of a cumulative impacts study would be substantial, as would the installation of best available technologies to reduce the capture of eggs and larvae. Entrainment and impingement studies financed by power companies in the Hudson River exceeded \$2 million a year for monitoring and \$1 million for analysis. An eight-week entrainment sampling effort required for a TECO permit renewal cost \$250,000. And while some techniques to decrease entrainment are relatively low in cost (i.e., TECO's installation of fine-mesh screens on intake pipes at its Big Bend plant), other solutions such as the construction of cooling towers to reduce the need for bay water can cost hundreds of millions of dollars. These costs potentially could be reduced by the utilization of alternative sources of water, such as wastewater or industrial effluent, and further investigation of such alternative technologies should be encouraged.

Thus, the need to assess the cumulative effects of entrainment must first be demonstrated and the possible benefits of such a study balanced against its cost implications for utilities and their customers. EPA is currently involved in a national workgroup that is examining the biological effects of power plants, and this effort may lead to new regulations requiring power plants to minimize those impacts. This action encourages the participation of local and state regulators in the workgroup to assist them in reaching a consensus on whether a cumulative impacts study of power plants in Tampa Bay is warranted.

STRATEGY:

- STEP 1** Participate in the EPA national workgroup on power plant entrainment.
Responsible parties: Tampa Bay NEP, FDEP, Florida Marine Research Institute (FMRI), local power plant representatives
- STEP 2** Depending on the results of the EPA workgroup, determine whether a cumulative impacts study is necessary and justified. If it is, local, state and federal regulators should design a scope, identify potential data needs and funding sources, and conduct a comprehensive entrainment study. Based upon the results of that investigation, a plan to minimize entrainment through measures such as adjusting the operating or maintenance schedules of power plants for periods of peak plankton and juvenile abundance should be developed. The plan should be compatible with any new federal regulations adopted by EPA.
Responsible parties: EPA, FDEP, FMRI, local power plant representatives
- STEP 3** If warranted, amend state rules to require a cumulative impact review for all future power plant siting and operating permits located on Tampa Bay or its tributaries.
Responsible parties: Tampa Bay NEP, local power plants, FDEP

FW-4

ACTION PLAN

Bay Fish & Wildlife

SCHEDULE:

Step 1 was initiated in 1996 and workshops will continue through 1997, with regulatory action to be proposed in 1999 and implemented in 2001. Steps 2 and 3 are contingent upon Step 1. Step 2, if necessary, can be initiated in 1997. Step 3 can be initiated following the completion of the study, if the results of the study show a need for further action to reduce entrainment, beyond what new federal rules may require.

COST:

Step 1 entails only administrative costs. Step 2, the comprehensive cumulative impacts assessment, will likely involve extensive field, lab work and data analysis that could cost from \$1 million to \$5 million. The costs of remedial action to reduce entrainment have not yet been determined, but are expected to be substantial and should be evaluated in detail.

EXPECTED BENEFITS:

Enhanced fish stocks in Tampa Bay.

MONITORING ENVIRONMENTAL RESPONSE:

FDEP is the state agency responsible for power plant siting and permitting. EPA also has authority over power plant siting and operation permits. Monitoring of fish stocks is conducted by the FMRI. Results of any entrainment study, and subsequent actions to reduce the problem, will be reported in the Tampa Bay NEP's Biennial Environmental Monitoring Report.

REGULATORY NEEDS:

Possible amendments to the federal Water Pollution Control Act (Sections 316a, 316b and 402) and the Florida Electric Power Plant Siting Act (Sections 403.501 through 403.517, F.S.).

RELATED ACTIONS:

FW-5

Continue and Expand the Critical Fisheries Monitoring Program

FW-5

ACTION:

Continue the state's Critical Fisheries Monitoring Program and expand it to include oligohaline tributaries of the bay.

BACKGROUND:

Tracking the long-term health of bay fisheries is an important component of the ongoing monitoring program being developed for the Tampa Bay management plan. Recent water quality improvements in the bay, along with new regulations on commercial and recreational fishermen, make regular assessment of fisheries trends even more critical for bay managers. The fisheries surveys will serve as a barometer for the success of management efforts, and provide an early-warning system to alert managers to potential problems that may require additional actions.

Currently, the state Department of Environmental Protection's (FDEP's) Critical Fisheries Monitoring Program (CFMP) provides the most comprehensive sampling of fisheries in the bay. This program, conducted by the FDEP's Florida Marine Research Institute (FMRI), employs stratified random and fixed-station monitoring to assess the abundance and distribution of fish and macroinvertebrates in Tampa Bay. The stratified random sampling divides the bay into six habitat types (i.e., seagrasses, deep-water, riverine), which are sampled at varying locations twice a year, usually in the spring and fall and using gear suited to that particular bottom type. The fixed-station monitoring samples 24 stationary sites scattered throughout the bay once a month, using a single type of fishing gear. Both survey methods record the number, species and length of fish and invertebrates captured, as well as the temperature and salinity of the water.

The program is financed by revenues from the state's Salt Water Fishing License. More than \$2 million was allocated statewide to Critical Fisheries Monitoring in fiscal year 1995-1996, with about \$500,000 of that dedicated to sampling in Tampa Bay.

While the monitoring attempts to be as thorough as possible, funding and manpower limitations mean that some areas of the bay potentially important to fish recruitment and survival are not surveyed. For example, of the bay's myriad tributaries, only the Little Manatee, Manatee and Alafia rivers are sampled. Oligohaline segments of the Hillsborough and Palm rivers and numerous tidal creeks in Upper Tampa Bay, such as Double Branch Creek and Rocky Creek, are not assessed. The existing program could be expanded to include more oligohaline areas, using cost-effective fixed-station monitoring. Additionally, a quick visual examination of fish and invertebrates for the presence of visible lesions could be added to assist bay managers in tracking the long-term movement of toxic contaminants through the bay system.

ACTION PLAN

Bay Fish & Wildlife

STRATEGY:

- STEP 1** Evaluate the need and costs to expand CFMP into small tributaries and oligohaline areas, and identify candidate tributaries.
Responsible parties: Tampa Bay National Estuary Program (NEP) and FDEP/FMRI
- STEP 2** Require field scientists conducting the sampling to perform a quick visual examination for lesions on the fish and invertebrates they collect, and record the species, lesion type and location of the lesions, as well as the location where the affected fish were caught.
Responsible parties: FDEP/FMRI
- STEP 3** Incorporate results of the CFMP in Tampa Bay in the Biennial Environmental Monitoring Report, and redirect sampling efforts as needed.
Responsible parties: FDEP/FMRI, Tampa Bay NEP

SCHEDULE:

The Tampa Bay NEP and FDEP/FMRI will evaluate the feasibility of expanding fisheries sampling and develop a formal recommendation by April 1997. The detection of lesions indicative of toxic contamination could begin in 1997. The first expanded sampling also could begin in 1997.

COST:

The estimated annual cost for the current Tampa Bay sampling program is \$500,000. The cost of sampling 6-7 additional sites is estimated at \$50,000, based on salary estimates for two additional full-time staff personnel. Financing sources for additional sampling (if needed) could be pursued through a change in FMRI's current allocation from the Salt Water Fishing License revenues or identification of new revenue sources.

EXPECTED BENEFITS:

Implementation will provide more comprehensive information about the status and trends of bay fisheries, and will provide managers with an early-warning system to detect areas that may need additional management action.

MONITORING ENVIRONMENTAL RESPONSE:

FMRI currently monitors the health and abundance of fisheries within Tampa Bay. These reports can be incorporated in the Tampa Bay NEP's Biennial Environmental Monitoring Report for the bay.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

TX-1, TX-3, BH-1, FW-1, FW-3, FW-4

*Dredging to create Davis
Islands, Tampa (1925).*

DR



PHOTO: BURGERT BROTHERS

Dredging & Dredged Material Management

Coordination among local ports and bay interests in long-term planning for dredging and dredged material management is essential to minimize environmental impacts and costs, address disposal needs, and maximize opportunities to use spoil material for beneficial uses such as habitat restoration.

With an average depth of only 12 feet, regular dredging of the bay is necessary to maintain safe passage through shipping channels serving the bay's three major sea-ports, its shore-based power plants and industries, and recreational boaters. Dredging can benefit the bay by removing contaminated sediments and improving circulation in poorly flushed areas. But it also takes a toll by clouding the water and impacting bottom life in localized areas. Inertial ammonia also may be released to the water column and atmosphere as a result of dredging sediments with high organic content.

Disposal of dredged material presents another important challenge. Deepening of the 40-mile main shipping channel in the 1970s required the removal of up to 100 million cubic yards of sediment. Maintenance dredging to support the bay's three commercial

Develop a Long-Term Dredging and Dredged Material Management Plan for Tampa Bay

ACTION:

Develop a long-term management plan that coordinates the individual dredging and dredged material management plans of the bay's three major seaports, as well as utilities and industries and other users that rely on the bay's navigational channels.

BACKGROUND:

Tampa Bay serves three major seaports managed by independent port authorities. Various utilities and industries also share the bay's 40-mile-long deep-water transportation highway. This action calls for the development of a long-range plan to coordinate dredging and dredged material management for Tampa Bay to maximize shared disposal and beneficial use opportunities while minimizing the environmental impacts and costs associated with these activities in the future. The U.S. Army Corps of Engineers (USACOE), as the major coordinator and sponsor of dredging projects in the bay, has tentatively agreed to direct this comprehensive planning effort with funding assistance from the NEP.

With an average depth of only 12 feet, regular dredging of ship channels and berths is needed to serve area ports and industries. Ship channels, which are dredged to depths of up to 43 feet, must be cleared periodically to remove silty sediments.

Coordinated planning among ports and area industries will help ensure that the most environmentally sensitive and cost-effective strategies are pursued, especially in regard to long-range dredge material disposal, which has only been partially addressed. It also allows bay managers to explore options for beneficial uses of spoil material, minimize impacts to nesting birds on spoil islands, and promote best available technologies to reduce sediment resuspension during dredging.

In fact, local port authorities already have begun working together to examine mutual concerns and foster cooperation. A study conducted for Tampa Bay's port authorities and the Florida Department of Transportation (FDOT) in 1995 cited the establishment and maintenance of shared dredged material disposal sites as one of 13 recommendations adopted by the participants.

The Tampa Port Authority (TPA) estimates that about 840,000 cubic yards of material will be generated annually to maintain the upper part of the main ship channel, which extends south to the Gadsen Point widener. Long-term disposal needs will exceed the remaining capacity of the Port Authority's two spoil islands in Hillsborough Bay (estimated to be about 6 million cubic yards) in about seven years.

TPA has proposed to meet the shortfall by raising the islands' perimeter dikes from 20-30 feet, a strategy being reviewed by TPA's engineering department, as well as the Florida Department of Environmental Protection (FDEP) and the USACOE, which issues and periodically reassesses the port's maintenance dredging permit.

Maintenance dredging of the main ship channel between Gadsen Point and the mouth of Tampa Bay is expected to generate about another 200,000 cubic yards of material a year. Dredged material from the lower segment of that channel (below Cut B) will be placed at a recently approved ocean disposal site 18 miles from the bay's entrance. There are no long-term plans for disposal of the remainder of the material.

Port Manatee's development blueprint includes plans to enlarge its turning basin and widener, and dredge its harbor channel to maintain a 40-foot mean low water depth. A total of about 1.3 million cubic yards of material will be removed for these projects in order to keep pace with the anticipated shoaling of some 220,000 cubic yards of material each year. The Port Authority will contain all construction and maintenance dredging material at several upland sites on its property. These sites can accommodate material for at least another 25 years.

The Port of St. Petersburg, the smallest of the bay's three major seaports, will rely on the ocean disposal site for its sporadic dredging needs, unless cost-effective beneficial uses are identified for the material.

An unknown factor is how private facilities throughout the bay plan to dispose of their dredged material, an issue which should be addressed in long-term planning scenarios.

A strong emphasis on coordinated planning is reflected in 1996 guidance from the National Dredging Team, a consortium of federal agencies led by the EPA, Corps of Engineers and Department of Transportation. The draft guidance calls for the creation of regional planning committees to aid in the development of dredged material management plans.

STRATEGY:

This strategy calls for the development and implementation of a long-range plan to coordinate dredging and dredged material management for Tampa Bay, and highlights additional planning needs that must be addressed to complete this coordinated strategy.

STEP 1 Establish a Tampa Bay Dredging and Dredged Material Management Committee, directed by the Corps of Engineers and co-chaired by the FDEP, to develop and implement a long-term management plan. The Committee should include the bay's three major seaports, port-related industries and utilities, major commercial/private ports, government agencies, local governments, recreational and environmental interests and a representative of Egmont Key State Park. The Tampa Port Authority's existing Dredge Advisory and Migratory Bird committees, which include many of these same parties, may provide an initial membership base.

The Dredging and Dredged Material Management Plan for Tampa Bay should:

- coordinate existing port and industry plans for dredging and dredged material management; identify capacity short-falls; and develop a long-range strategy that integrates these plans to minimize costs and environmental impacts

DR-1

DR-1

ACTION PLAN

Dredging & Dredged Material Management

- explore long-term options for the disposal of spoil material, including beneficial uses such as habitat restoration
- promote best available technologies to reduce sediment resuspension and nutrient releases during dredging, spoil disposal and containment

Responsible parties: USACOE and FDEP, in cooperation with local port authorities and the Committee

STEP 2 Develop a 25-year plan for the management of maintenance material removed from the southern segment of the main ship channel from the Gadsen Point widener to the point where the main shipping channel enters the bay. The Corps should develop the plan in consultation with the Committee established in step 1. The Plan should be consistent with 1996 draft guidance from the National Dredging Team.

As part of the overall plan:

- Determine status of long-term spoil disposal plans for privately maintained shipping channels in the Bay, particularly channels serving Big Bend and other utilities.

Responsible parties: USACOE, in cooperation with local ports and the Committee

SCHEDULE:

With funding assistance from NEP, the project is expected to get underway in Spring 1997.

COST:

The Tampa Bay NEP has set aside \$40,000 to assist the Corps in developing a long-term management plan. The Corps is contributing a minimum of \$5,000 in-kind services. In-kind support also is anticipated from the area's three port authorities, the FDOT and other entities serving on the Committee.

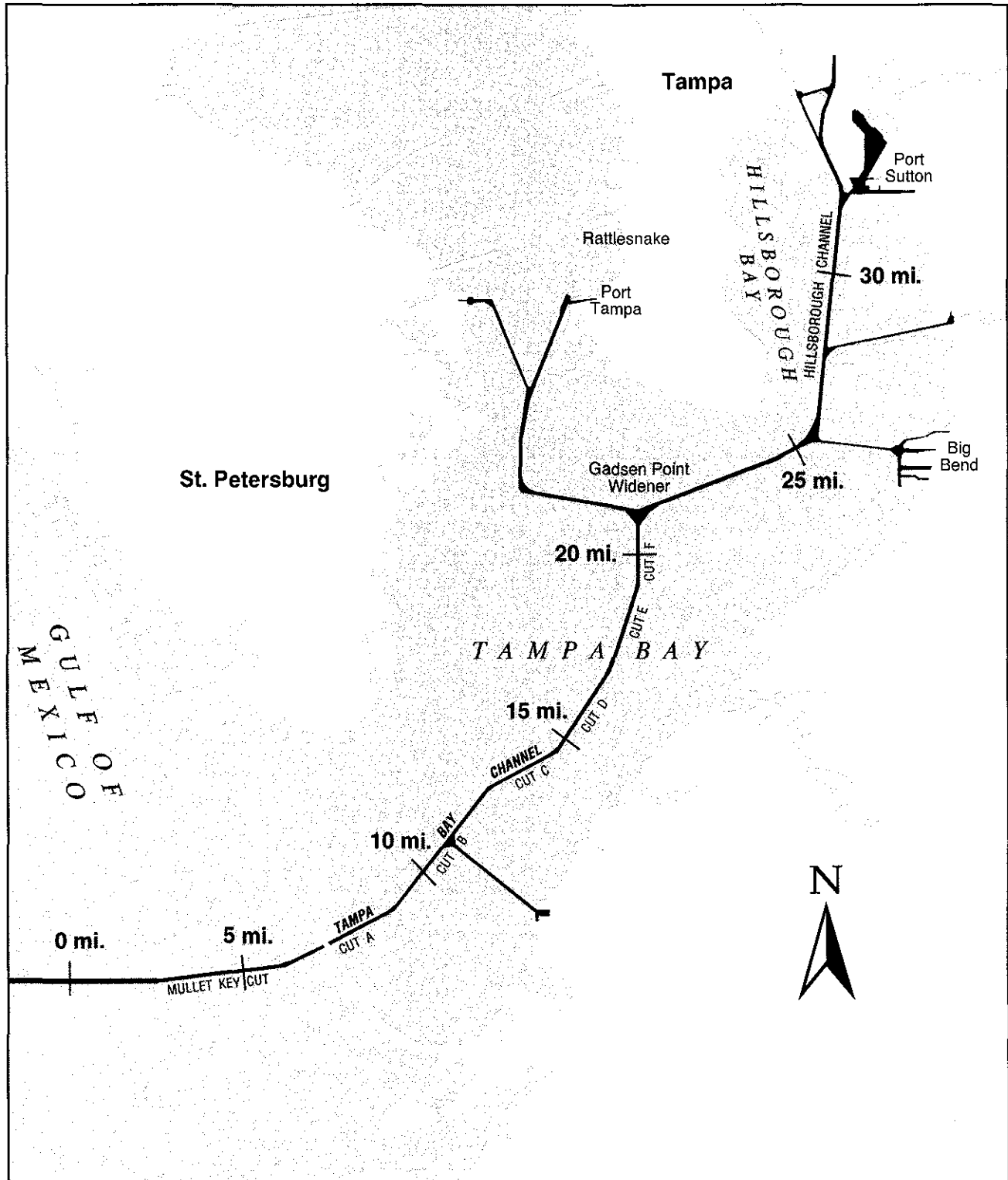
EXPECTED BENEFITS:

Coordinated, long-range planning will help to minimize impacts to bay habitats and water quality from dredging and dredged material disposal and maximize beneficial uses of spoil material, while fostering cooperation that is likely to yield cost-savings for community-supported port authorities. Removal of muck from channels also can help to improve water quality in localized areas.

MONITORING ENVIRONMENTAL RESPONSE:

The USACOE will be responsible for monitoring progress on long-range planning and implementation.

Tampa Bay Shipping Channels



SOURCE: TAMPA PORT AUTHORITY

ACTION PLAN

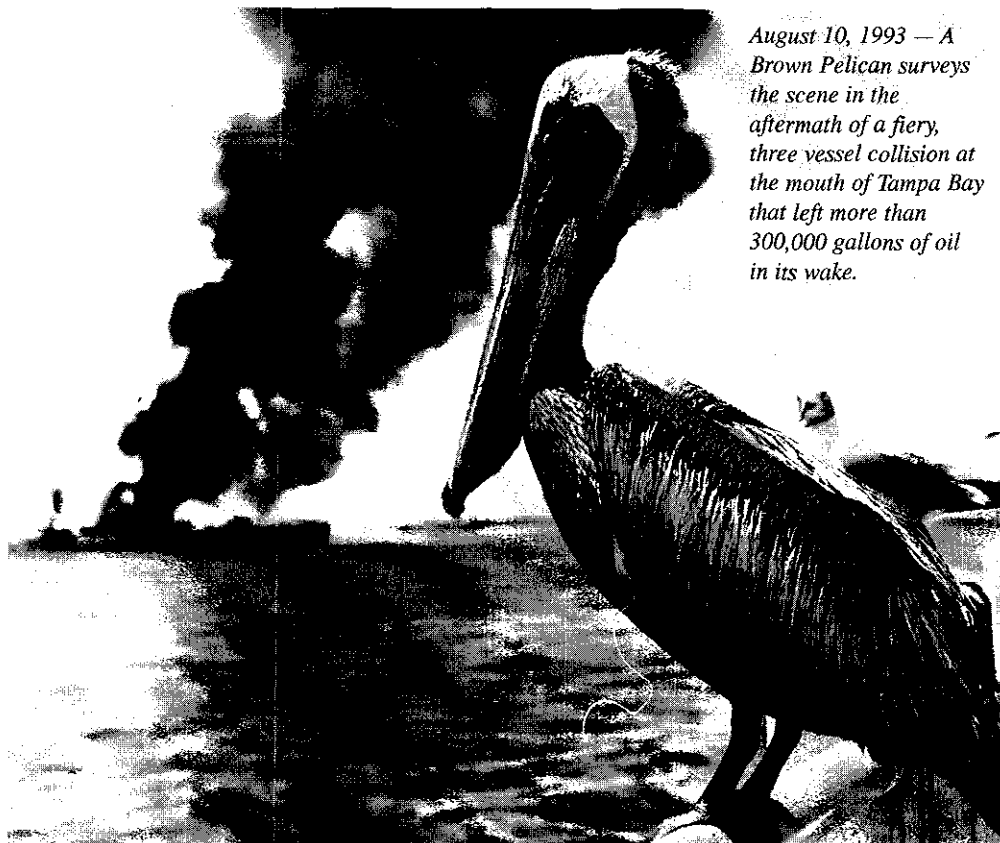
Dredging & Dredged Material Management

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

BH-1



August 10, 1993 — A Brown Pelican surveys the scene in the aftermath of a fiery, three vessel collision at the mouth of Tampa Bay that left more than 300,000 gallons of oil in its wake.

PHOTO: PETER CLARK, TAMPA BAYWATCH

Spill Prevention & Response

Installation of an integrated vessel tracking system to guide large ships through Tampa Bay ranks as one of the highest priorities in the prevention of oil and hazardous materials spills. Securing a permanent source of funding for the maintenance of the bay's Physical Oceanographic Real-Time Systems (PORTS), which provides valuable tide and current data to commercial and recreational boaters, also is a priority.

On average, about 4 billion gallons of oil and other hazardous materials pass through Tampa Bay each year on huge ships the size of modern skyscrapers. These ships traverse a long, relatively narrow shipping channel that leaves little room for navigational errors.

In addition, billions of gallons of hazardous materials and chemicals — including petroleum products, phosphoric and sulfuric acid and anhydrous ammonia — are



ACTION PLAN

Spill Prevention & Response

stored in tanks at various ports and industrial facilities along the bay. While spill prevention efforts are essential for all hazardous materials, they are particularly significant in dealing with highly toxic, water-soluble compounds such as anhydrous ammonia or sulfuric acid. A spill of these materials could have a severe, although relatively short-term, impact on the bay's fish and wildlife and threaten public safety.

A three-vessel collision at the entrance to Tampa Bay in August 1993 was a vivid reminder of the bay's vulnerability. More than 330,000 gallons of oil escaped, fouling area beaches and mangroves and killing dozens of seabirds. More extensive damage was averted due to favorable tide and weather conditions and quick deployment of response crews.

Federal law requires that commercial shippers and facilities be capable of handling the cleanup of a worst-case scenario oil or fuel spill. However, large spills can require that additional equipment and personnel be brought in from other parts of the state and Gulf region. That makes effective advance planning and coordination essential.

While large spills have been rare in Tampa Bay, the cumulative impact of countless small spills of less than 25 gallons from fuel and bilge pump discharges and unintentional leaks represents a chronic problem.

MANAGEMENT OBJECTIVES

- Prevent catastrophic spills of oil and other hazardous materials.
- Reduce chronic smaller discharges from boats, ships, marinas and other sources.
- Minimize the environmental impact of spills through planning and response.

SUMMARY OF ACTIONS FOR SPILL PREVENTION & RESPONSE

- SP-1 Establish an integrated vessel tracking system for Tampa Bay and permanently fund the PORTS system.
- SP-2 Evaluate and update spill response plans for priority areas.
- SP-3 Improve fueling and bilge-pumping practices among recreational boaters.

ADDITIONALLY...

The Tampa Bay National Estuary Program (NEP) has recommended that the Environmental Protection Agency's (EPA) Emergency Response and Removal Branch sponsor a local workshop to assist operators of oil transport and storage facilities in complying with the mandates imposed by the Oil Pollution Act of 1990. The workshop would help dispel the confusion over the differing requirements of EPA, the Coast Guard and the Florida Department of Environmental Protection. An estimated 471 million gallons of oil are stored in tanks at area ports. EPA is considering the request.

Improving state authority over harbor pilots is another issue that merits further atten-

tion. A journey from the Gulf of Mexico into the Port of Tampa can take three to seven hours, and mariners at the helm of the ships must make split-second decisions. Highly skilled and locally knowledgeable harbor pilots are the first line of defense against accidents. They are especially important given that there presently are no emergency anchorages available for ships to pull into in case of an emergency, and a huge container vessel may require a mile or more to come to a complete halt.

Currently, the bay's harbor pilots undergo a rigorous training, examination and apprenticeship period before being allowed to guide a ship on their own. The piloting system is governed by the state Department of Professional Regulation (DPR) and appointed representatives of the piloting and maritime industries, who serve on the state Board of Pilot Commissioners.

The 1993 oil spill served as the catalyst for a re-examination of the current oversight mechanisms. Following the spill, the Legislature passed a bill expanding the grounds for discipline of state pilots to include actions against a driver's license for alcohol- or drug-related reasons, and piloting while in an impaired state. The bill also closed a loophole which had prevented discipline of state pilots whose federal licenses had been placed on probation or who had voluntarily surrendered their federal license in lieu of prosecution.

Despite these improvements, additional changes could further reduce the risk of a spill or collision in the bay. One proposal is for Florida to follow the federal policy of requiring a pilot to prove that he is not negligent if he hits a fixed object. Under federal law, a pilot must show that the ship malfunctioned, someone disobeyed orders or some other factor led to the accident. Another proposal is for voice recorders to be placed on ships to document an accident. These proposals, and steps to ensure adequate continuing education for harbor pilots, deserve careful consideration.

SP

Establish an Integrated Vessel Traffic System for Tampa Bay and Permanently Fund the PORTS System

ACTION:

Establish an integrated vessel traffic system for Tampa Bay to reduce the potential for maritime collisions and spills. Additionally, secure a permanent funding source for the bay's Physical Oceanographic Real-Time System (PORTS), which provides real-time tide and current data to commercial and recreational mariners and to the spill response community.

BACKGROUND:

Tampa Bay is home to three major seaports, a growing cruise ship industry, and dozens of power plants and businesses that utilize the bay for transportation. More than 4,000 ships enter Tampa Bay each year, transporting over 4 billion gallons of oil, petroleum products and other hazardous materials.

Guiding large vessels along the bay's 44-mile main ship channel, in fair and foul weather, through shallow depths and amid increasing boating activity challenges even the most experienced mariner. The absence of a coordinated vessel tracking system for the bay increases this pressure, as well as the potential for spills resulting from accidents.

Currently, pilots and ship captains on Tampa Bay rely on a radio broadcast network to exchange vessel information when entering or departing port. Large vessels are equipped with ship-board radar, but the quality and range of these systems vary. In fact, limited navigational systems on some vessels force pilots to rely heavily on personal knowledge and skills to safely complete each transit.

Tampa Bay was one of several ports scheduled to receive a U.S. Coast Guard Vessel Traffic System (VTS) in 2002, although federal funds have not been appropriated and the acquisition appears unlikely. The proposed system's exclusive reliance on radar is another important limitation. While radar can pierce fog and darkness, its accuracy and range is limited in heavy rain. Severe and sudden thunderstorms — a summer signature in Tampa Bay — can reduce visibility and radar capabilities to zero, increasing the potential for groundings and accidents.

Differential global positioning systems (DGPS) can reduce or eliminate these risks. DGPS transmits high-precision data on vessel movements in all weather conditions, using a lap-top computer that can be carried aboard or installed on ships. The device enables pilots to view the position and movement of vessels in real time. Collision-avoidance data and weather information also are provided, and the system can be fully integrated with radar surveillance to provide 100 percent coverage of vessel traffic on Tampa Bay. When combined with shore-based radar, DGPS provides the safest available means for navigation. This added protection is particularly vital in Tampa Bay,

which has the longest transit of any port in Florida and no intermediate deep-draft anchorages.

The Tampa Bay NEP supports implementation of the best available DPGS technology as soon as possible. A 1995 state legislative report confirmed the need for a more sophisticated system and led to the formation of a Tampa Bay Area Vessel Traffic and Information Service (VTIS) Consortium to investigate options and develop an implementation plan. The group includes the area's three port authorities, the Coast Guard and representatives of local shipping and piloting interests.

A preliminary report released by the Consortium in March 1996 suggests a phased implementation, beginning with upgrades to the existing system. A \$40,000 grant from the NEP will be used to purchase a closed-circuit television for surveillance at Pendola Point near the Port of Tampa to augment a system proposed for installation at the Skyway Bridge. NEP funds also will provide a multi-channel transceiver to back up existing communications and recording equipment in the event of an equipment or power failure. These components are part of an overall plan for a formal Vessel Traffic Information Service (VTIS) jointly operated by the Coast Guard and the Tampa Bay maritime community.

The Tampa Bay NEP also supports permanent funding for the ongoing management of Tampa Bay's PORTS system, which provides vital tide and current data to navigators. The system's "real-time" measurements are most critical to pilots of large commercial vessels and to spill response crews who must quickly and carefully execute containment and cleanup plans. In the 1995 spill, PORTS was instrumental in tracking and predicting the movement of the oil slick.

In recent years, the PORTS system has received funding from maritime industries, the Hillsborough County phosphate severance tax, the Coastal Protection Trust Fund and the Florida Department of Transportation for maintenance of the system. However, no permanent funding has been secured.

STRATEGY:

STEP 1 Support efforts to implement a VTIS utilizing the best available technology as soon as possible.

Responsible parties: Tampa Bay NEP, in cooperation with local governments and the Tampa Bay VTIS Consortium

STEP 2 Secure a permanent source of funding for PORTS.

Responsible parties: local governments and Florida Legislature

SCHEDULE:

The final VTIS implementation plan was submitted to the Florida Legislature in November 1996. The NEP already has committed \$40,000 for upgrades to the existing navigational monitoring system. Step 2 is ongoing.

SP-1

ACTION PLAN

Spill Prevention & Response

COST:

Sources estimate that a combined DGPS-radar system will cost \$2 million, including installation and training, and another \$450,000 annually to maintain the system.

Funding options for installation and maintenance include: user fees (all vessels entering port), Florida Seaport Transportation and Economic Development Trust Fund, State Transportation Trust Fund, General Revenue and the Florida Coastal Protection Trust Fund (FCPTF).

Ongoing maintenance funding for the \$1.2-million federally financed PORTS system, which was installed in 1991, is estimated at \$220,000. Funding options include: county boater registration fees, navigation districts, port user fees, FCPTF, Hillsborough County phosphate severance tax. The last two sources currently provide maintenance funding, but long-term commitments have not been secured.

EXPECTED BENEFITS:

A combined vessel traffic and information system and real-time weather and current data will ensure the highest level of spill prevention and response for Tampa Bay.

MONITORING ENVIRONMENTAL RESPONSE:

Collision-avoidance data from the new vessel traffic system could be used to measure the success of this technology to aid in spill prevention. The Coast Guard Marine Safety Office tracks all oil and hazardous materials spills.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

SP-2, SP-3

Evaluate and Update Spill Response Plans for Priority Areas in Tampa Bay

SP-2

ACTION:

Develop detailed spill response plans for environmentally sensitive areas of Tampa Bay to enable quick and effective deployment of crews and containment/cleanup equipment in the event of an oil or hazardous materials spill.

BACKGROUND:

A scientific support subcommittee participating in the development of Tampa Bay's Area Contingency Plan (ACP) — the U.S. Coast Guard's strategic plan for responding to oil spills in Southwest Florida — met several years ago to prioritize areas of the bay most vulnerable to spills and develop site-specific response strategies. The seven priority areas, and recommended protection strategies, identified by the group were:

- Terra Ceia Bay - Block off sensitive inner embayments and direct oil east to a causeway collection area.
- Bishop Harbor - Protect inner portions of the harbor and direct material south to causeway collection area.
- Cockroach Bay/Little Manatee River - Protect inner areas portions of Cockroach Bay and Piney Point and direct material south to Port Manatee or north to Bahia Beach or Apollo Beach.
- Bullfrog Creek - Protect the creek and direct material to Cargill along the north side of the Alafia River for collection, or south to TECO property.
- Bower Tract - Block entrances to creek and direct material to Courtney Campbell Causeway for collection.
- Weedon Island - Implement the island's own spill response plan and direct material to nearby causeway for collection.
- Ft. DeSoto - Protect inside "arrow" of Ft. DeSoto Park, directing material to Ft. DeSoto Beach for collection.

For each area, the group recommended the development of more detailed response plans, including maps identifying response staging, equipment storage and materials collection areas; access points; boat ramps and channel markers; and water depths. The group also urged the installation of permanent boom anchors, where appropriate and technically feasible, to improve spill response and reduce boom deployment time. Overall response planning has been aided by a computerized forecasting and analysis program developed by the Florida Marine Research Institute (FMRI). That analysis program was tailored for use in Tampa Bay in 1996 with NEP funding. The Marine Spill Analysis System includes a series of data layers depicting existing conditions in the bay, sensitive resources and physical landmarks such as roads and boat ramps. The system can be used to create maps that show the extent of a spill and project its course.

ACTION PLAN

Spill Prevention & Response

STRATEGY:

STEP 1 Reconvene the ACP's scientific support subcommittee to evaluate and update response plans for each of the seven priority sites identified. Ensure that these plans are consistent with the methodology employed in the development of the Tidal Inlet Protection Strategies for Oil Spill Response for the Southwest Coast of Florida, a 1995 report based on research by the Marine Spill Response Corporation and the Florida Department of Environmental Protection (FDEP).

Responsible parties: U.S. Coast Guard Marine Safety Office, in cooperation with FMRI, FDEP and NEP

STEP 2 Continue to work with the FDEP, Coast Guard and local emergency response groups to ensure consistency in planning and response strategies.

Responsible parties: NEP

SCHEDULE:

All steps will be initiated in 1997.

COST:

To be determined, based on recommendations of the subcommittee and the scope of planning.

EXPECTED BENEFITS:

Detailed response plans for these priority areas will help protect the bay's most environmentally sensitive resources and enable quick and effective deployment of response crews and equipment.

MONITORING ENVIRONMENTAL RESPONSE:

The FDEP's Bureau of Emergency Response monitors the environmental impacts from and response to oil spills.

REGULATORY NEEDS:

None anticipated

RELATED ACTIONS:

SP-1

Improve Fueling and Bilge-Pumping Practices Among Recreational Boaters

SP-3**ACTION:**

Improve fueling and bilge pumping practices among recreational boaters.

BACKGROUND:

As the number of recreational boaters utilizing Tampa Bay increases, small fuel spills and releases of oily bilge water also are expected to escalate. Small, but chronic, spills occur routinely through careless fueling habits, operation of outboard motors, discharges of oily bilge water and improper disposal of used oil products. According to the National Research Council, these small spills account for 90 percent of the oil that ends up in the nation's waterways.

Although many boaters store their boats on land, thousands of vessels remain in the bay at marinas, yacht clubs and countless docks. Some boat insurance policies require automatic bilge pumps, but boat owners also pump their bilges manually. The cumulative amount of oil entering the bay as a result of recreational vessel bilge-pumping can be substantial.

Typically, recreational vessels stored dockside use automatic bilge pumps to prevent accidental sinkings from equipment failures or storms. These pumps are activated when the interior volume of water reaches a certain level. The bilge water that is automatically pumped from vessels with internal engines may contain small amounts of fuel, cleaning solutions and other chemicals that pollute the bay.

In addition, fuel spills frequently occur when boat owners fill their tanks. Boat owners often can't tell when the tank is full until the overflow valve discharges diesel or gasoline into the bay.

Federal and state laws prohibit the discharge of any fuel or oil within 12 nautical miles of shore. As little as a single cup of fuel can cause a "fuel sheen," which is a misdemeanor that can result in a warning or fine. To help prevent discharges, very large commercial vessels are required to have oil-water separators. However, these are not required, and are often impractical, for smaller vessels. Additionally, only vessels longer than 26 feet in length are required to have a placard reminding the operator that oil discharges are prohibited.

Though enforcement of these regulations is difficult because of the number of boaters and marinas on the bay, current U.S. Coast Guard procedures since April 1995 allow enforcement officers to cite violators. The Tampa Marine Safety Office conducts daily patrols and has written 33 tickets to recreational boaters (and 22 to commercial boaters). Fines range from \$50 to \$1,000 for a first offense, depending on the size of the spill and can escalate up to \$25,000 a day for large spills. Boater education remains the most effective long-term strategy for reducing chronic spills of oil, fuel and oily bilge water to the marine environment. According to a 1992 survey by the

SP-3

ACTION PLAN

Spill Prevention & Response

Tampa Bay National Estuary Program (NEP), boaters are more concerned than land-bound residents about environmental impacts, so heightened awareness may accelerate responsible actions by this group.

There are no recreational bilge pump-out facilities in Tampa Bay. If a marina has drums set up to receive oily water, boat owners often have to manually pump their bilge water into buckets and transfer it to a drum — a cumbersome practice that dissuades all but the most environmentally conscientious boaters. Davis Island Yacht Club has established such an operation; boat owners are charged 55 cents per gallon for a pump-out, which pays for the proper disposal of drums.

Use of existing commercial products can assist these efforts. Bilge pillows, diapers and oil-absorbent pads, available at most marine stores, act like magnets in separating oil from bilge water. Boat owners put them in their bilges and dispose of saturated pads, oil-water mixtures and other hazardous boat chemicals in a proper waste container or with a recycler. Various oil-water separators, designed to fit most vessels, also are available for less than \$50 for installation in the vent line.

Boater education courses, offered by the Coast Guard Auxiliary now include environmental protection and fueling safety components. Coast Guard Reservists who are SEA PARTNERS present environmental programs and attend boat shows to educate the public and boaters.

This action seeks to reduce small spills by improving education of new boaters and boat owners who store their vessels in the water.

STRATEGY:

The strategy to improve fueling and bilge-pumping practices encourages boat owners with internal engines and fuel tanks to install fuel-overfill protection devices and oil-water separators, where feasible. It also emphasizes boater education and outreach to yacht clubs, sailing organizations, marinas, and “high-dry” facilities where boats are stored.

STEP 1 Encourage registered boat owners to install fuel overfill protection devices and fuel-water and oil-water separators in automatic bilge pumps.
Responsible parties: Florida Department of Environmental Protection (FDEP), U.S. Coast Guard Auxiliary, Marine Manufacturers Association, Florida Sea Grant

STEP 2 Develop educational materials that will stimulate solutions to bilge contamination and fuel handling situations. Ideally, materials will include a free sample “oil- sorb” product that will allow the recreational boater to see, first hand, the practical application of such a product.
Responsible parties: FDEP, U.S. Coast Guard Auxiliary, SEA PARTNERS, Florida Sea Grant

Note: Extensive educational material produced by manufacturers and other boater environmental education programs (Puget Sound Alliance,

Chesapeake Bay Foundations, Center for Marine Conservation [CMC] etc.) already exists and can be tailored for local use.

- STEP 3** Distribute materials to yacht clubs, sailing schools, boating organizations, and boat shows around the bay, as well as to all marinas that store boats in the water and in "high and dry" facilities. Form or utilize an existing speakers bureau to address these groups and possibly distribute free oil-sorb samples in partnership with one of the leading manufacturers.

Responsible parties: *FDEP, U.S. Coast Guard Auxiliary, SEA PARTNERS, Florida Sea Grant, CMC*

SP-3**SCHEDULE:**

The Tampa Bay National Estuary Program will enlist the organizations listed above to evaluate on-going programs and materials, and develop a plan to implement the steps outlined above in 1997.

COST:

Costs to develop and distribute educational materials will be determined based on format selected, but should be accomplished through existing resources or available grants. Manufacturer and boat dealership sponsors should be aggressively pursued.

EXPECTED BENEFITS:

Reduced small spills during fueling and during automatic bilge pumping.

MONITORING ENVIRONMENTAL RESPONSE:

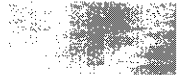
The measure of success for this action will be a reduction in the number of minor spills reported.

REGULATORY NEEDS:

None anticipated.

RELATED ACTIONS:

TX-3, PH-3





EPA
Administrator
Carol Browner
lends a helping
hand to Lakewood
school students
planting marsh grass
during restoration
work in Tampa (1994).

PHOTO: TAMPA BAY NATIONAL ESTUARY PROGRAM

Public Education & Involvement

A Community Advisory Committee established in 1991 has assisted the Tampa Bay National Estuary Program in developing outreach strategies and understanding public concerns and perceptions about the bay. Appointed by the NEP's Policy Committee, members include representatives of agriculture, business, education, fishing and the environment, who also share their perspectives as citizen-taxpayers and residents of the communities they represent.

The Committee has played a key role in soliciting public feedback on strategies for bay improvement. In 1995, citizen advisors hosted a series of informal focus groups to discuss the bay's most pressing needs and options for addressing them with neighbors, business associates, maritime and fishing groups, and other community interests. Feedback from these participants identified areas of broad support and issues of potential controversy. A second and highly successful series of focus groups and larger Town Meetings on Tampa Bay were conducted in 1996, following the January 1996 release of the draft Comprehensive Conservation & Management Plan (CCMP).

ACTION PLAN

Public Education & Involvement

This action plan, developed by the Committee, recommends priorities and plans for public education and involvement in the future as the NEP and its community partners begin implementation of the CCMP.

Future community outreach should seek to:

- foster continued community support for bay restoration and CCMP implementation by continuing to educate residents about bay issues, and publicize the bay's progress and needs
- improve public faith in the ability of bay managers and organizations dedicated to its restoration to "work smart" to leverage resources, avoid duplication and focus on priorities
- maximize direct opportunities for public involvement in bay restoration and protection.

A top priority in 1997 will be the development and distribution of a public summary of the final CCMP for residents, legislators and community leaders. This will lay the foundation for a series of annual progress reports to the community documenting progress in the implementation of the bay plan.

Other 1997 initiatives proposed by the Community Advisory Committee include:

- a public opinion poll to identify community concerns and comprehension of bay issues, as well as gauge support for bay restoration initiatives and funding
- a small grants program to support grass-roots bay restoration and improvement projects by community groups and schools, with special outreach to low-income and minority groups
- periodic public forums, sponsored by NEP, on controversial and important bay issues, such as NEP's televised debate on the Ban-The-Nets referendum
- development of a graphic-and-text environmental index on the state of Tampa Bay for periodic publication in local newspapers

The Committee and NEP also will evaluate the need for a companion to the 1996 Teachers Guide to Tampa Bay, a middle-school curriculum kit developed by the NEP and Tampa Tribune for distribution to more than 350 schools. Additionally, the Committee recommends:

- continued distribution of the Boater's Guide to Tampa Bay, a publication of the NEP and Florida Marine Research Institute which already has been distributed to more than 100,000 boaters.
- continuation of the NEP newsletter, *Bay Guardian*, to spotlight the state of the bay and progress in the bay's recovery, and aggressive efforts to publicize bay issues in the media to inform and educate the public;

ACTION PLAN

Public Education & Involvement

- continued advocacy of bay restoration and protection efforts in cooperation with other public policy and interest groups, and efforts to educate the public on issues affecting the bay;
- continued support for organizations that enlist and effectively utilize volunteers, such as Tampa BayWatch, The Florida Aquarium and the National Audubon Society.
- periodic “spotlight on solutions” field trips targeting and co-sponsored by various audiences with regulatory and natural resource interests. For example, a field trip hosted by a local alliance of developers might target urban designers and show-case exemplary commercial landscapes that enhance the environment. Public field trips to bay restoration sites and parks also might be offered in cooperation with The Florida Aquarium.

Funding to implement these initiatives will be covered in the NEP’s annual workplan or secured through grants and community partnerships.

CHARTING
the **COURSE**

FOR TAMPA BAY**PE**



ACTION PLAN

Implementation & Financing

This chapter describes how the Comprehensive Conservation & Management Plan (CCMP) for Tampa Bay will be implemented by local governments, agencies and other bay stakeholders, and discusses the oversight role of the Tampa Bay National Estuary Program (NEP) in ensuring that the goals of the plan are achieved.

Local government and agency partners in the Tampa Bay NEP anticipate signing an agreement in early 1997 pledging to carry out the recommendations of the final management plan. The agreement will include specific goals for the recovery of natural resources, such as seagrasses and wetlands, as well as water and sediment quality goals, and priorities for spill prevention and response and dredging and dredged material management. It also will spell out each partner's responsibility for meeting those goals, and a timetable for achieving them.

But how those targets are reached will be left up to individual communities, who may select the most suitable options from among a range of alternatives. Many of those options are described in this plan as examples of how a community might comply with its commitment to reduce pollution in the bay. This approach not only emphasizes flexibility, but allows local governments to focus their limited resources in the most cost-effective and environmentally beneficial manner.

Additionally, the implementation strategy outlined in this chapter addresses how these goals and initiatives for Tampa Bay will be integrated into existing management plans and regulatory programs.

Existing bay management expenditures also are presented to provide an understanding of how much money is currently allocated and where it is going. Financing options that follow illustrate possible sources of revenue and approaches to accomplish goals of the plan that might not otherwise be achieved with existing resources. Wherever possible, the Tampa Bay NEP advocates the reallocation or more efficient use of existing revenues to carry out recommended actions.

Implementing the Plan for Tampa Bay

Successful implementation of the CCMP will require firm commitments for action, flexibility for local governments to pursue the most cost-effective strategies to achieve a particular goal, integration of goals and strategies into existing regulatory programs and rules, and effective oversight to ensure that actions are carried out in a timely manner.

Commitments will be secured through an implementing agreement which NEP partners expect to sign in 1997, after the bay management plan has been approved. These partners include Hillsborough, Pinellas and Manatee counties; the cities of Tampa, St. Petersburg and Clearwater; the Southwest Florida Water Management District (SWFWMD); Environmental Protection Commission of Hillsborough County; the Tampa Port Authority; Florida Department of Environmental Protection; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency (EPA). Other agencies, such as the Florida Game & Fresh Water Fish Commission, also will be encouraged to sign the formal agreement.

The goals of the CCMP (Chapter 4 of this document) are the goals of the implementing agreement, which will require agencies and local governments to develop individual action plans detailing projects that will satisfy those goals.

A key objective of the agreement is to achieve nitrogen management goals approved by the Tampa Bay Management Committee in 1996. Local government action plans will address that portion of the nitrogen goal which relates to stormwater runoff and municipal point sources. A Nitrogen Management Consortium of local electric utilities, industries and agricultural interests, as well as local government and regulatory agency representatives, has been established to develop an action plan to address the remainder, which is attributed to atmospheric deposition, industrial and agricultural sources and springs. The consortium, which includes local government and agency representatives, is to deliver its action plan by August 1997.

Action Plans to Achieve Bay Goals

Within 12 months of signing the implementing agreement, each participating local government and agency will submit an action plan to the NEP's Management and Policy committees detailing how it will meet its responsibilities. Communities may employ various strategies to reach their respective goals. Action plans will include descriptions of proposed projects, how that project contributes to achieving goals (quantified, where applicable), with supporting documentation of benefits, an implementation schedule, and a cost and financing plan.

These action plans are particularly important in relation to nitrogen loading goals, because relevant aspects of these plans will be incorporated into regulatory permits. These action plans may be based on ongoing watershed initiatives begun prior to the adoption of the comprehensive plan for Tampa Bay, such as Pinellas County's Allen's Creek watershed initiative, as long as these watershed plans are consistent with the bay plan's objectives. In fact, watershed action plans that address specific basins within the larger bay ecosystem can be an excellent tool for implementing the bay plan.

Integrating the Plan into Existing Environmental Rules & Programs

Once government and agency action plans to achieve bay goals are approved by the Program's Management and Policy committees, these action plans will be incorporated into state and federal water quality permits addressing direct or point discharges and stormwater management. Local governments will amend their comprehensive plans to promote, and assure consistency with, the approved action plans.

The CCMP has been developed in cooperation with the bay area's six largest local governments, broad-based community interests, and environmental agencies at the local, state and federal levels, to reach consensus on bay restoration goals and strategies. The Tampa Bay NEP also has coordinated closely with local environmental alliances devoted to improving and protecting specific regions of the bay, including the Hillsborough River Greenways Task Force and related greenways initiatives and the Cockroach Bay Aquatic Preserve Management Team. Both these public-private alliances of environmental and economic stakeholders are excellent models for community-based planning.

A key partner in the Tampa Bay NEP has been SWFWMD and its Surface Water Improvement and Management (SWIM) Program, which is expected to play an important role in implementing the bay plan. Because of its prominent role, identifying a permanent source of funding for the SWIM program will be crucial to long-term bay restoration efforts.

The Tampa Bay NEP also works closely with the Agency on Bay Management (ABM), which is the natural resources committee of the Tampa Bay Regional Planning Council. ABM is spearheading efforts to investigate and make final recommendations to the NEP for several important actions in the Bay Habitats Action Plan.

Results of a Federal Consistency Review, to evaluate and address any inconsistencies among goals of other government programs and those established for Tampa Bay, are available as an appendix to this document.

Roles of the Tampa Bay NEP in Overseeing Implementation

The success of the Tampa Bay NEP ultimately will be measured in bay improvement achieved through implementation of the CCMP. Consequently, a key ingredient for success is defining who should oversee implementation of the plan and what oversight should entail.

In 1996, the local governments and agencies comprising the Tampa Bay Management Conference elected to continue their participation in the NEP to oversee implementation of the plan. The primary oversight roles of the Tampa Bay NEP will be to monitor progress (in implementation and the bay's recovery), assist implementation, continue public outreach and involvement and improve data management. Specific efforts associated with these functions are outlined below.

One of the strengths of the Tampa Bay NEP is the precedent-setting alliance of local governments and regulatory agencies represented on the NEP's Policy Committee, which sets overall direction and contributes funding for the Program. In fact, local government and agency partners feel that maintaining this decision-making structure — with regulators and regulated interests working together toward common goals and assisted by scientific and community advisors — is critical to assuring implementation of the plan for Tampa Bay. This bottoms-up approach to environmental management gives all partners a voice in the future of Tampa Bay.

The Policy Committee also is evaluating options for expanding Management

Conference membership to broaden representation by smaller local governments and private industry, as well as other agencies that may play an important role in the bay's future.

EPA has set aside \$1.2 million, or \$300,000 per year over four years beginning in 1997 to assist the Tampa Bay NEP in overseeing implementation of the CCMP. The federal contribution requires a local funding match of 25 percent, to be provided by the NEP's local governments and agency participants.

A comprehensive evaluation of the goals and strategies established through the NEP for Tampa Bay will be conducted five years after the adoption of the plan to ensure that restoration efforts and funding are effectively targeted.

Oversight Roles

Monitor & Report Progress

- Monitor progress in implementing bay action plans and achieving goals for Tampa Bay
- Revise action plans and goals as necessary, based on new findings
- Prepare an annual progress report for the NEP Management and Policy Boards, and the community on progress in charting the course for Tampa Bay
- Produce a biennial bay monitoring report for bay managers

Assist Implementation

- Seek timely implementation of priority actions
- Pursue grants and other funding to support bay restoration
- Direct or coordinate technical investigations and other efforts to assist implementation (especially studies on atmospheric deposition conducted in partnership with EPA)
- Provide staff support for the Management Conference of the Tampa Bay NEP, comprised of participating local governments, agencies, and technical and community interests devoted to bay improvement
- Assist in conflict resolution if mediation is needed

Public Outreach and Involvement

- Continue community outreach and involvement efforts, promoting priority issues, progress in charting the course for bay restoration, and bay stewardship and involvement

Data Management

- Improve public and agency access to bay management data and information, particularly on the Internet

Cost & Financing

Costs associated with individual actions presented in *Charting the Course* are presented in those action summaries. In many cases, these represent the level of effort that an implementing party might anticipate in budgeting these tasks. However, these should not automatically be construed as requirements for new sources of revenues, since some of these initiatives can be accomplished with existing resources or by redirecting current funding allocations to better address the bay's needs.

Additionally, a number of actions seek to improve coordination and planning among local governments and agencies, and may actually result in cost savings for currently funded activities.

In fact, the Tampa Bay NEP strongly advocates the reallocation or more efficient use of existing resources to carry out recommended actions. A study by the NEP indicates that existing bay-related expenditures at the local, state and federal levels exceed \$250 million per year (based on FY94-95 budgets). Of that amount, 68 percent, or roughly \$170 million, is devoted to wastewater collection, reuse and treatment — activities that either indirectly or directly benefit the bay, even if they aren't performed solely for the bay's benefit. These activities are funded largely through wastewater utility enterprise funds, created by local governments expressly for these purposes.

The next largest allocation of 14 percent, or nearly \$35 million, is expended primarily by local governments and the Southwest Florida Water Management District for stormwater management, including handling and treatment. About half of these programs are financed through stormwater utility funds. The remainder comes from ad valorem taxes, energy utility taxes, permit fees and licenses, pollution trust funds and state and federal general revenues.

Budgets for habitat restoration, preservation and management total approximately \$7 million or nearly 3 percent, excluding land acquisition (another 4 percent). Regulation and enforcement funding, dredging and dredge material management, environmental monitoring and public education comprise \$13.5 million, or 5.4 percent of the expenditures. General revenues, in combination with ad valorem taxes and special fees and licenses, are used to finance these various efforts.

Preliminary analyses indicate that the cost to maintain existing nitrogen loadings to the bay may be relatively minimal over time. Nitrogen loadings to the bay are expected to increase 7 percent by 2010, or about one-half of one percent per year. Annual costs to offset those loads are estimated at approximately \$100,000 per ton of nitrogen*, or about \$1.7 million per year.

Preliminary costs also have been established for habitat restoration, another focal point of the comprehensive plan for Tampa Bay. Those figures suggest that approximately \$350,000 of existing annual expenditures (excluding land purchase costs) would be necessary to restore about 20 acres of low-salinity tidal stream habitat per year.

Although costs for meeting other goals have not been fully determined, recommended actions will focus on cost-effective use of existing resources and a clear return on investment. Any additional funds required to restore Tampa Bay will be documented

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FOR TAMPA BAY

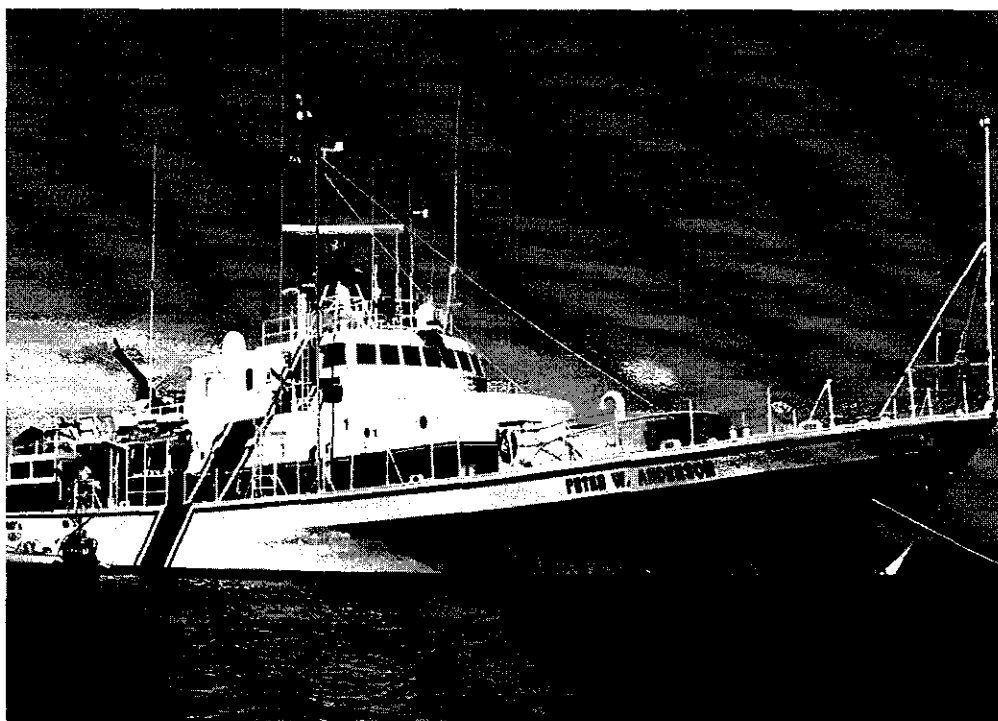


PHOTO: BOB WESTENHOUSER/TAMPA TRIBUNE

Monitoring Bay Improvement

Efforts to monitor Tampa Bay's health are central to the success of bay restoration efforts, for monitoring enables communities to measure return on investment and helps environmental managers validate or refocus existing strategies for bay improvement.

An effective monitoring program provides the data necessary to assess the status and trends in the health and abundance of the bay's wildlife and habitats. This information allows local governments and agencies to evaluate progress made in the restoration and protection of Tampa Bay. The data also provides insights into the effectiveness of current management strategies, indicating when goals have been met, if actions should continue, or whether more stringent efforts are warranted.

Monitoring the changes caused by management actions in an estuary is not as simple as counting fish or measuring water quality. Estuaries, by their very nature, are dynamic systems. Populations of fish, birds and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes in an estuary can be difficult —

and distinguishing changes caused by human actions from natural variations can be even more difficult.

The coordinated bay monitoring program devised by the Tampa Bay National Estuary Program (NEP) in cooperation with local governments and agencies is designed to address many of these challenges by building on existing efforts to more fully and clearly assess progress in the bay's recovery.

Tampa Bay benefits from several existing water quality, habitat and fisheries monitoring programs, including an ambient water quality monitoring program conducted by the Environmental Protection Commission (EPC) of Hillsborough County since 1974. These programs have contributed significantly to the wealth of knowledge available on the Tampa Bay estuary.

The monitoring design devised by the Tampa Bay NEP builds on this foundation. Existing monitoring programs have been standardized and expanded in some areas, and new components — to measure atmospheric deposition, bay sediment chemistry and the health of benthic communities — have been added.

A series of workshops with local government and agency partners helped to define five general monitoring objectives for the water quality, fisheries, benthic and habitat components of the program. These objectives are to:

- estimate the areal extent of the bay that does not provide adequate water quality conditions to support seagrasses and other living resources
- assess the abundance and health of bay fish populations over time
- estimate the areal extent of degraded benthic habitat in the bay and within each bay segment
- estimate the areal extent and quality of seagrasses, mangroves and emergent bay wetlands
- estimate the areal extent of oligohaline (low-salinity) habitat in the bay and its tributaries.

This focus on measuring the areal extent of bay conditions expands upon traditional methods and can dramatically increase the value of information collected. For instance, simply considering the average concentration of dissolved oxygen throughout the bay may appear to indicate that water quality standards have been met. But, in fact, this may not be the case, since water quality in some portions of the bay may still be inadequate — or much better than average. The new approach will indicate how much of the bay, by percentage or number of acres, is not meeting water quality conditions to support seagrass recovery targets. It also enables more effective assessment of trends in cases where some areas decline and others improve but the overall condition does not change.

Another new element in the monitoring program for Tampa Bay is an increased emphasis on communicating information in a standard and more meaningful format. Prior to standardization, monitoring programs used various methods to communicate their results. The monitoring framework has been specifically designed to compile and synthesize results from major monitoring programs in a single comprehensive document produced every two years and first published in the Fall of 1996. A separate

summary report will be written for decision-makers responsible for the management of Tampa Bay.

Monitoring workshops will be held every two or three years, allowing environmental professionals from various programs to meet and review findings. A comprehensive report detailing the bay monitoring plan is available from the Tampa Bay NEP.

MONITORING COMPONENTS

The environmental monitoring program for Tampa Bay addresses five components:

1. Water quality
2. Benthos, sediment chemistry and composition
3. Atmospheric deposition
4. Bay habitats (including seagrasses, emergent wetlands and oligohaline areas)
5. Bay fisheries and wildlife.

Two of the monitoring components — for benthos and atmospheric deposition — are new. The monitoring plans for water quality, bay habitats, and fisheries and wildlife build on existing programs. Monitoring costs are covered through the operating budgets of participating local governments.

Components of the environmental monitoring plan for Tampa Bay are summarized below.

HYPOTHESES ADDRESSED

Monitoring results will enable bay managers to assess whether conditions baywide — and by bay segment, in most cases — are improving or declining. The monitoring program for Tampa Bay is designed to answer the following questions:

Water Quality

- Are phytoplankton biomass levels (chlorophyll-*a* concentrations) above, below or consistent with established bay segment targets?
- Are nutrient concentrations increasing, decreasing or remaining stable?
- Is water clarity increasing, decreasing or remaining stable?
- Is the areal extent of low dissolved oxygen concentrations (< 2mg/L) increasing, decreasing or remaining stable?

Benthos

- Is the composition of benthic species changing?
- Are sediment characteristics changing?
- Is the composition of bottom-dwelling finfish changing?
- Are the frequency and spatial distribution of fish pathogens increasing, decreasing or remaining stable?

Atmospheric Deposition

- Are nutrient loads and toxic materials from atmospheric deposition directly to the surface of Tampa Bay increasing, decreasing or remaining stable?

Bay Habitats

- Is the areal coverage of seagrass increasing, decreasing or remaining stable, and how does this compare with baywide restoration/protection targets?
- Is the areal coverage of saltwater wetlands, low-salinity wetlands and associated uplands increasing, decreasing or remaining stable, and how does this compare to baywide restoration/protection targets?

Fish and Wildlife

- Are fish populations increasing, decreasing or remaining stable?
- Are manatee populations increasing, decreasing or remaining stable?
- Are bottlenose dolphin populations increasing, decreasing or remaining stable?
- Are colonial water-bird populations increasing, decreasing or remaining stable?

WATER QUALITY

While current programs measure trends in water quality over time very effectively, they were not originally designed to provide estimates of the spatial extent of conditions in the bay. Four local governments measure water quality at 126 stations in Tampa Bay, including 21 sites in Old Tampa Bay; 23 in Hillsborough Bay; 22 in Middle Tampa Bay; 17 in Lower Tampa Bay; 21 in Boca Ciega Bay; and 22 in the Manatee River and Terra Ceia Bay. These stations were selected to meet the needs of their respective programs and may not entirely satisfy the needs of the baywide environmental monitoring program. To truly determine the extent of conditions reported, stations must be randomly selected.

Samples are measured for dissolved oxygen, phytoplankton biomass (chlorophyll-*a*), water clarity (Secchi depth, photosynthetically active radiation, color, total suspended solids and turbidity), and water column nutrients (nitrogen, phosphorus and organic carbon).

Nearly 70 percent of the 126 original stations have been incorporated into a statistically valid baywide monitoring design. The design is based upon the U.S. Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP) grid, which allows for random station selection. It enables local governments to continue their long-term study at many stations while providing a more rigorous method to evaluate the spatial extent of conditions in specific bay segments.

The bay's three surrounding counties and the City of Tampa monitor water quality in the bay. These parties have agreed to standardize collection and analysis methods, share data and contribute collated data for the development of the biennial monitoring report. These communities also are participating in the West Coast Regional Ambient Monitoring Program (RAMP), an ongoing effort, initiated by the Tampa Bay and Sarasota Bay NEPs, the Southwest Florida Water Management District (SWFWMD) and local governments to coordinate environmental monitoring data from Tampa Bay

to Charlotte Harbor. All field and analytical methods employed, and QA/QC protocols, are in accordance with approved methods of the EPA and/or the Florida Department of Environmental Protection (FDEP).

BENTHIC COMMUNITIES AND SEDIMENT ANALYSIS

A new component in Tampa Bay's monitoring program was established in 1993 to evaluate the quality of bay-bottom sediments and their effects on bottom-dwelling sea life. Samples are collected annually during an "index" period (September to October) that is representative of worst-case conditions for each year. Collection sites match those randomly selected for water quality sampling.

The benthic monitoring program is evaluating the abundance and composition of benthic species found throughout the bay to identify those areas that differ from expected patterns. Since some species of benthos are more sensitive to environmental stress, these areas may indicate impacts from contaminants, habitat alteration or other trauma.

The health and abundance of benthic organisms are indicators of the bay's overall health. Specific indicators include species richness and diversity, as determined by detailed taxonomic analyses of collected specimens. If contaminants are present in the water column or sediments, filter-feeding benthic organisms and detritivores can accumulate these contaminants in their tissue. They also are an important link in a food web that supports many forms of marine life, and can therefore pass on accumulated contaminants to other organisms that feed on them.

Dissolved oxygen is another indicator scientists use to gauge the health of the bay's benthic communities. Research in nearby Sarasota Bay indicates that stressed seagrass beds may not support the fish and other aquatic life typically associated with healthy grass beds. The lack of sealife may be a result of low levels of dissolved oxygen during pre-dawn hours, an issue that will be addressed in Tampa Bay as an element of the benthic monitoring program.

Sediment quality also is addressed in the benthic monitoring program, in addition to taxonomic and dissolved oxygen measurements. Indicators include chemical content (trace metals) and grain-size analysis.

The benthic monitoring program also calls for local governments to monitor contaminants in sediments as part of their assessments. Initial studies indicate that some areas of the bay contain contaminated sediments, but the severity and spatial extent of contamination in these areas are currently unknown. Beginning in 1996, sediments will be tested for whole-sample toxicity using the Microtox method. In addition, the NEP recommends that the effects of contaminants on benthic life be studied in future years using bioassays that subject test organisms to benthic sediments. Observing the health of benthos exposed to sediment samples in a laboratory will help to identify toxic sites or areas of healthy benthos. Sediment chemistry and toxicity measurements have been designed to correlate with other monitoring programs and allow comparison of toxicity data across the country.

Currently, the bay's three surrounding counties participate in the benthic monitoring program. A field and laboratory methods manual for the Tampa Bay benthic monitoring program, available from the Tampa Bay NEP, details QA/QC protocols. Its methods are based on standard EMAP methodology tested and reviewed by the EPA.

ATMOSPHERIC DEPOSITION

Preliminary research indicates that roughly a third of the nitrogen loading in Tampa Bay, as well as a significant percentage of cadmium, copper and lead, comes from atmospheric deposition directly to the surface of the bay.

In cooperation with EPA's Great Waters initiative, local air and water quality divisions, as well as SWFWMD, the FDEP and the Florida Department of Transportation (FDOT), are participating in a long-term monitoring program for local atmospheric deposition. The 18-month daily sampling effort, which began in August 1996, is designed to assess atmospheric contributions of nitrogen to Tampa Bay by measuring rainfall and dryfall, according to procedures and protocols established by the National Atmospheric Deposition Program (AIRMOn) and peer-reviewed by researchers from National Oceanographic Atmospheric Administration's (NOAA) Air Resources Laboratory.

In addition to the intensive single-site Great Waters wetfall/dryfall deposition monitoring, the Tampa Bay NEP has recently completed a pilot program to examine the spatial variability of atmospheric deposition. Nutrient and heavy metal loadings from atmospheric deposition at seven sites were measured in the Tampa Bay watershed. Pesticides (including DDT) and other organic pollutants also were measured at selected sites. Weekly samples were monitored for levels of copper, lead, zinc, nitrates and phosphorus. Mercury, which also is associated with atmospheric deposition, is being monitored under a separate program through the FDEP. The pilot program will provide new insights into the distribution of contaminants transported by rainfall and dustfall.

BAY HABITATS

The amount and quality of habitat available for fish and wildlife is critical to maintaining and restoring Tampa Bay. Many species have specific habitat requirements that must be met for their survival.

Ongoing monitoring efforts have demonstrated recovery of seagrasses in some areas of the bay. SWFWMD maps seagrass beds using aerial photographs taken every two years and verifies the data with field checks gathered from 60 randomly selected sites, providing an important indicator of the success of seagrass recovery. The health of seagrasses in randomly selected areas also is monitored every two years by measuring density of plants, the number of blades per plant and the relative density of epiphytic algae attached to the grass blades. More frequent monitoring may be required if significant declines in seagrass coverage or health are noted in the future.

The City of Tampa conducts more detailed seagrass monitoring in Hillsborough Bay.

Low-salinity or oligohaline habitats along tributaries (where salinities range from 0-10 parts per 1000) are critical for juvenile fisheries. The boundaries of these habitats fluctuate with the flow of fresh water in natural cycles. These habitats have been hard-hit by development and diversions of fresh water to serve the region's potable water needs.

Until recently, few efforts had been made to quantify the loss of low-salinity habitats, but new studies by regional and state agencies have mapped these wetland areas and

provided salinity measurements from area rivers. Separate studies by SWFWMD, conducted as part of their minimum flow permit requirements, will determine the effects of changes in freshwater inflows to Tampa Bay, including impacts to fisheries and other aquatic life. Responsibility for long-term monitoring of oligohaline habitats has not yet been assigned.

FISH & WILDLIFE

Fish and wildlife in the Tampa Bay region have declined sharply over the past 30 years. Activities to document their resurgence as new bay management practices are implemented will be necessary to maintain ongoing support for bay restoration.

The FDEP's Critical Fisheries Monitoring Program, established in 1990, provides the most comprehensive sampling of fisheries in the bay. This program, conducted by FDEP's Florida Marine Research Institute (FMRI), employs stratified random and fixed-station monitoring to assess the abundance and distribution of the bay's fish and macroinvertebrates.

To monitor potential environmental effects from toxic or hazardous materials, the Tampa Bay NEP has recommended that the program be expanded to document abnormalities in all fish over 75mm long, including tumors, parasites, skeletal malformations and deformities in the gills, mouths and eyes. The largest five fish in each target species also would be analyzed for chemical contaminants.

FDEP also monitors the numbers of endangered sea turtles, manatees and bottle-nose dolphins in Tampa Bay with aerial surveys conducted annually over nearshore waters. Data collected includes location, species, number of adults and calves and animal behavior.

The bay's colonial breeding bird populations are monitored by Audubon Society's Tampa Bay Sanctuaries, which conducts an annual ground survey and census at island nesting sites in the region. Audubon also sponsors an annual Christmas count, dispatching teams of volunteers to various places to note numbers and varieties of birds. Aerial surveys of pelicans and mid-winter surveys of waterfowl are conducted by Florida's Game and Fresh Water Fish Commission annually throughout the state. In the future, it may be beneficial to establish specific goals for populations of colonial waterbirds and nesting birds, as additional measures of the overall health of the bay.

DATA MANAGEMENT AND ANALYSIS

To facilitate data sharing, monitoring data will be available through a decentralized system maintained by the Florida Growth Management Data Network Coordinating Council located in the Governor's office in Tallahassee.

In this system, participants check, verify and maintain their own databases, often in a variety of physical locations using various software and hardware. The Council has developed a central subject directory (CSD) for Tampa Bay to allow users to easily and rapidly access data. The CSD was created from an existing computer database as an element of the Council's statewide directory.

Agencies collecting data agree to submit entries to the CSD describing their in-house databases; meet minimum standards for in-house data documentation; and routinely

provide this documentation when transferring data. Agencies maintaining water quality databases must periodically submit their monitoring data to Florida's STORET system. Use of the STORET system ensures that the water quality data will be stored securely and available to a wide variety of users nationwide.

MONITORING PERFORMANCE

Performance criteria are explicit levels of environmental change that may be detected through monitoring. These criteria, and periodic evaluations of how well the program meets those criteria, will ensure that the sampling intensity is appropriate to the level of change anticipated as a result of management actions. For example, infrequent sampling could result in a monitoring program incapable of detecting anything but catastrophic change. Extensive sampling, on the other hand, may unnecessarily waste resources to measure changes of little importance. Water quality and habitat monitoring will allow comparisons of bay conditions to established targets for bay restoration and protection. The sampling regime has been designed to detect spatial and temporal changes at meaningful ecological scales. Biological monitoring will evaluate whether water quality and habitat enhancements are providing a suitable environment for healthy populations of plants and animals. Statistical power analysis will be used every 2-3 years, or as needed, to modify the monitoring programs.

EVALUATING PROGRESS

Participants in the Tampa Bay monitoring program recognize that monitoring efforts are only as good as their ability to get current and accurate data to appropriate managers in a timely manner. A bay monitoring report, first published in 1996 by the NEP, incorporates data from various governmental agencies and communities into a common format. Information for the biennial report will be compiled by SWFWMD, using in-house resources for data analysis and presentation.

A key objective of the report is to assess progress toward achieving restoration and protection targets set forth in the Comprehensive Conservation and Management Plan (CCMP) for the scientific community and general public both.

The format includes updated environmental data focusing on both status and trends within Tampa Bay and its watershed. The report also highlights areas where additional management actions may be needed as an early warning system for local and state governments responsible for maintaining the environmental integrity of Tampa Bay. Finally, the report provides a periodic assessment of the effectiveness of monitoring efforts, enabling managers to modify elements as needed to meet program objectives and goals.

In addition to monitoring the bay's vital signs, efforts also will be directed to monitoring the success of specific actions or outreach efforts. For example, while it may be impossible to measure impacts to water quality resulting from reduced use of fertilizer in the watershed, public awareness and practices can be measured using public opinion polls or by evaluating product sales at retail outlets. A monitoring component is included with each individual action presented in *Charting the Course*.

A comprehensive review of the goals and strategies for bay restoration will be conducted every five years.

Research Priorities for Tampa Bay

Technical advisors to the Tampa Bay NEP have identified several research priorities for the bay to be pursued as funding becomes available. They are to:

- Continue research on the impact and sources of atmospheric deposition.
- Determine the impacts of changes in freshwater inflow on oligohaline habitats.
- Investigate the effects of toxic contaminants on fish and wildlife in key areas such as McKay Bay.
- Continue identification of sources of sediment contamination.
- Evaluate potential for contamination of wildlife (fish and birds) feeding in stormwater ponds.
- Identify causes of sediment resuspension and non-chlorophyll *a* turbidity.
- Determine the need and best locations for regional stormwater facilities.
- Identify light requirements for seagrasses in all bay segments.
- Determine the extent and natural and anthropogenic sources of hypoxia.
- Evaluate the cost-effectiveness of pollution prevention programs such as the Florida Yards & Neighborhoods Program.

Other research needs identified by the NEP's Technical Advisory Committee focus on:

- Determining minimum widths for vegetated buffers.
- Assessing anthropogenic influences on the duration of red tide.
- Continuing research on experimental seagrass transplanting techniques and suitable sites.
- Assessing the impacts of thermal discharges.
- Assessing the distribution and abundance of oyster reefs and other shellfish resources in Tampa Bay, and evaluating alternative methods of assessing public health concerns.
- Assessing the threat of invasive exotic species entering the bay in ship ballasts.
- Assessing the need for zooplankton monitoring.
- Assessing filling of deep dredged holes in the Palm River and other dredged channels.
- Assessing evaluation techniques used for determining public health issues.

CHARTING
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Public Involvement

A well-crafted community outreach program that enlists and involves diverse interests as partners in bay restoration and protection is a hallmark of all successful National Estuary Programs.

This principle has guided the Tampa Bay National Estuary Program (NEP) since it was established in 1991. A public opinion poll conducted for the Program that year found citizens generally were willing to pay more to restore the bay—but wanted assurances that current programs “work smart” to effectively apply existing regulations and resources before adding new mandates. Responses also indicated that citizens didn’t fully understand the bay’s most pressing problems, or how actions at home impact the health of the bay.

Survey results confirmed the need for diverse public input in developing the Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay. Findings also pointed to the need for a broader campaign to educate the community about the bay and foster public stewardship of this environmental and economic resource.

These findings became the springboard for a Community Advisory Committee established by the Tampa Bay NEP in 1991. Composed of citizens with diverse perspectives and backgrounds from the bay’s three surrounding counties, the 25-member forum has provided structured input from people who share a common interest in a healthy bay. Advisors are appointed by the NEP’s Policy Committee and include residents and representatives of agriculture, industry, education, fishing, and environmental experts and activists, who also share their perspectives as citizen-taxpayers. Members also provide information to constituents and help design and execute community outreach programs.

This chapter profiles key elements of the NEP’s public education and involvement efforts and recommends ways to maximize community participation in the future. It also details public participation in the development of the CCMP and concerted efforts to solicit feedback on the draft plan released in January 1996.

Addressing the Bay’s Priority Problems

Priority issues, such as stormwater runoff and seagrass protection, have provided a focal point for educational outreach.

Studies by the Tampa Bay NEP estimate that stormwater runoff contributes about half of the bay’s total nitrogen input and significant amounts of heavy metals and pesticides. Yet fewer than half of the citizens responding to a public opinion poll on Tampa Bay in 1991 were able to identify stormwater runoff as a major source of bay pollution.

Even fewer recognized their own potential contribution to stormwater pollution. In fact, while most residents believe businesses are the major source of bay pollution, residences — which far outnumber commercial sites — actually contribute more to the bay's total nitrogen input. And that contribution could grow as more people move into the region.

Yards & Neighborhoods as Pathways to the Bay

Yards and neighborhoods are one of the bay's first lines of defense against pollution in stormwater runoff. Nevertheless, many homeowners fail to understand the potential impact of excess fertilizer, pesticides and water used in landscape care on the long-term health of Tampa Bay. The connection may be immediate in a waterfront neighborhood, or gradual, through the flow of stormwater drains, ditches, streams or rivers.

To publicize these concepts and enlist residents in pollution prevention, the National Estuary Programs of Tampa Bay and Sarasota Bay and the Florida Cooperative Extension Service established the Florida Yards & Neighborhoods (FY&N) Program in 1991. Experts from county extension services, which administer the program, teach residents ways to reduce runoff pollution and enhance their environment by improving home and landscape management. The program promotes the establishment of Florida Yards, which emphasize native and other beneficial plants that blend beauty and environmental benefits. The program also emphasizes least-toxic techniques for landscape maintenance to reduce pesticides in runoff to the bay.

In 1994, the West Coast Regional Water Supply Authority joined the FY&N founding partners in a move to expand the program in Hillsborough, Pinellas, Pasco and Manatee counties. Participating neighborhoods learn and apply environmental landscaping techniques and other pollution prevention practices. To advance these concepts, the FY&N Program has produced a number of educational tools, including a Florida Yards & Neighborhoods handbook, a Florida YardStick poster which helps homeowners measure progress in improving the environmental quality of their landscape; and various slide shows and newsletters.

Actions presented in *Charting the Course* seek to expand these efforts and reach more people by further enlisting retailers, developers and landscaping professionals, as well as other non-profit educational groups, to promote FY&N concepts. Local governments also are called upon to lead by example by landscaping and maintaining public properties in accordance with these environmental principles. These groups can help stimulate consumer demand for Florida Yards that are less maintenance-intensive, resulting in reduced pesticides and fertilizers in runoff to the bay.

Educating Boaters to Protect Seagrasses

Seagrass protection has been another educational priority of the Tampa Bay NEP. Studies estimate that roughly one-third of the bay's seagrasses are moderately to heavily scarred as a result of prop scarring by boats that cut through shallow grass flats or dredge their way free after running aground. Intense scarring at several bay locations, including Weedon Island Preserve, Cockroach Bay and Ft. DeSoto Park, has led to boating restrictions and an increased emphasis on boater education.

To promote protection of seagrasses and other vital bay habitats, the Tampa Bay NEP and the Florida Department of Environmental Protection (FDEP) published a Boater's Guide to Tampa Bay in 1992. While bay stewardship is the central theme of the guide, the guide's strength is that it features helpful boating information in a handy format that invites use. The guide's focal point is a 34"-by-22" color chart of Tampa Bay that identifies ship channels, seagrasses, aquatic preserves, reefs and public boat ramps. The chart's flip side features profiles and illustrations of native habitats, manatees and birds of the bay. It folds to 9"-by-4" standard road map size for easy on-boat storage and is available in both water-resistant and recycled stocks.

More than 100,000 Boater's Guides have been distributed to boaters locally through marine patrol units, marinas, tax collector's offices, local agencies and special events. FDEP, which is using the Tampa Bay guide as a template for the development of boater's guides throughout Florida, has since produced six additional boaters guides in a statewide series.

The Tampa Bay NEP also produced a series of high-quality interpretive signs for installation at more than a dozen high-use boat ramps and waterfront parks along the bay. The set includes a master sign featuring a map of the Tampa Bay estuary and seagrass areas, and companion signs on various bay wildlife and habitats.

Enlisting Volunteers for Bay Improvement

The Tampa Bay NEP has been instrumental in supporting volunteer efforts for bay restoration and protection. In 1993, the Program helped establish a Bay Conservation Corps under the direction of Tampa BayWatch, a non-profit bay stewardship group. Since then, BayWatch has enlisted more than 3,000 citizens for dozens of bay improvement projects, including salt marsh plantings, bird island cleanups and an award-winning wetland nursery program with area high schools (see profile in Community Partnerships below). The organization serves as a clearinghouse to match interested volunteers with hands-on activities around the bay sponsored by various agencies and communities.

The Southwest Florida Water Management District's (SWFWMD) Surface Water Improvement and Management (SWIM) program, and numerous other community organizations, also utilize volunteers for bay restoration efforts.

Since 1993, the Tampa Bay NEP and BayWatch have hosted an annual Great Bay Scallop Search, in which teams of volunteers don snorkels, masks and fins to comb seagrass beds in search of the elusive bay scallop. The scallop disappeared from Tampa Bay in the 1960s when the bay was badly polluted. Improved water quality and seagrass conditions have rekindled hope that the bay can once again support a self-sustaining scallop population. Experimental stocking efforts, initiated several years ago, are being evaluated.

Developing Community Partnerships for Bay Restoration

A Bay Grants program established by the Tampa Bay NEP in 1992 has been an important catalyst in developing community partnerships for bay restoration. Since then, the

NEP has awarded over \$50,000 in small grants to more than a dozen organizations, schools and communities for projects to educate and involve citizens in bay improvement. These initiatives have leveraged the talents and resources of numerous organizations, maximizing the community's return on investment and benefits to the bay. Profiles of projects and partners are provided below.



Tampa Bay Docents—An NEP grant helped The Florida Aquarium establish a Bay Docents program in 1993 to train interested volunteers to lead weekend BayWalks on Tampa Bay at Tampa's McKay Bay Nature Park and Weedon Island Preserve in Pinellas County. The Program has since trained more than 30 guides and introduced hundreds of children and adults to the bay's coastal ecosystems. Docents must complete a class and field course conducted by The Florida Aquarium, and commit to leading a minimum of six BayWalks per year. BayWalks are now a permanent component of the aquarium's community programming, providing an excellent model for other communities.



Operation BayWorks—This Hillsborough County project assists businesses in developing and implementing pollution prevention plans to reduce stormwater runoff. The pilot in 1995 and subsequent workshops have attracted nearly 100 businesses from targeted industry sectors, including landscape maintenance, construction and automotive repair. Participants receive pollution prevention workbooks designed specifically for their industries, along with instructional and promotional literature. The program will be evaluated for implementation in other watershed counties.



Coastal Wetland Nursery Program—With funding from the NEP, Tampa BayWatch enlists high school ecology clubs in cultivating wetland plants for coastal restorations. The initial NEP grant financed the construction of a wetland nursery at St. Petersburg's Lakewood High School, where students cultivated and transplanted more than 2,000 salt marsh plants, and development of an instructional guide to assist other interested high schools. The idea is taking root at other bay area schools and BayWatch eventually hopes to produce about 75,000 salt marsh plants each year to aid in local restorations.



Eco-Landscaping for Businesses—Businesses are beginning to appreciate the bottom-line benefits and beauty of native Florida landscapes, which require less water, fertilizer and pesticides, thanks to an educational campaign led by the Tampa Audubon Society in cooperation with the Florida Association of Environmental Professionals, Westshore Alliance, Lewis Environmental Services and the Tampa Bay NEP. A \$4,500 grant to the Tampa Audubon Society assisted in the development of a corporate "pitch" brochure and slide show that highlights cost-savings and environmental benefits. The group will target large commercial developments where landscape modifications may be cost-effective, as well as urban and landscape designers involved in planning new commercial projects.



Least-Toxic Pest Controls—The effectiveness of natural predatory insects as an alternative to pesticides was tested in a six-month trial using various ornamental crops, under the direction of the Manatee County Cooperative Extension Service. Results showed important cost and labor savings, in addition to environmental benefits associated with reduced pesticide use. Workshops also were conducted to promote least-toxic pest management techniques to nurserymen and growers.



Emerson Point Restoration—Volunteers led by the Manatee County Soil & Conservation District teamed up to restore severely damaged mangroves and salt marshes at this conservation site. The project also produced a plant and conservation guide to Emerson Point and neighboring Terra Ceia Aquatic Preserve.



Egmont Key Seagrass Protection—Navigational buoys were installed by the Egmont Key Alliance at this popular coastal barrier island to deter boat traffic from heavily scarred seagrass beds. Interpretive signage on the island educates boaters about the importance of protecting these vital grassbeds.



Model Florida Yard Landscaping Demonstration—This project by Hillsborough County's Public Utilities Department involved the design and installation of a low-maintenance Florida landscape and interpretive signage at northwest Hillsborough's Austin Davis Library, where visitors can learn about and view bay-friendly landscape concepts that can be applied at home.



Shell Key Bird Nesting Protection—The St. Petersburg Audubon Society received a \$500 grant from the Tampa Bay NEP to develop an educational sign for installation at this important bay bird nesting site to educate visitors about the island's feathered inhabitants.

A special community partnership between the Tampa Bay NEP and The Florida Aquarium was formed in 1995 to support development of a Florida Landscapes exhibit at the entrance to the aquarium. This living exhibit features a mosaic of native habitats, from beaches and wetlands to wildflower gardens, along with interpretive signage that promotes the environmental benefits of native landscaping. Funding from the NEP also supported educational programs to promote Florida Yard concepts and will be used in 1997 to develop an interactive software kiosk on Tampa Bay for visitors.

Outreach to Schools

Fostering an environmental ethic among students, who represent the region's future decision-makers, is particularly important.

Through partnerships with local school districts and The Florida Aquarium, the Tampa Bay NEP has sponsored field trips and workshops for several thousand area students and hundreds of instructors. Most recently, the NEP and the Tampa Tribune produced a six-unit curriculum kit on Tampa Bay for middle school students in the Tampa Bay area.

Junior-high and high school students participated in outdoor learning labs at Cockroach Bay, McKay Bay, Emerson Point and Weedon Island. The NEP targeted younger schoolchildren with performances by the Marine Gang, a group of costumed sea creatures whose creative mix of music and theater bring the bay to life on stage. With support from the Tampa Bay NEP, the Marine Gang introduced more than 65,000 elementary school students to the wonders of the estuary and kid-friendly tips for pollution prevention. The Marine Gang is administered through the Museum of Science & Industry, which continues to offer the program to schools and community groups thanks to funding from the SWFWMD.

Charting the Course for Tampa Bay

COMMUNITY INVOLVEMENT IN THE DEVELOPMENT AND REVIEW OF THE BAY PLAN

The Tampa Bay NEP has brought together diverse sectors of the community as partners in the development of the plan for Tampa Bay. This effort began in 1991 with the establishment of the Community Advisory Committee and continued in 1996 with increasingly focused efforts to expand public participation in the plan's review and finalization.

What you had to say

Hundreds of residents and representatives of local governments, agencies and organizations shared their views with the NEP on the proposed management plan for Tampa Bay. The Spring 1996 issue of Bay Guardian, the NEP's quarterly newsletter, recaps public response and some of the most frequent questions NEP received. Comments from the community were overwhelmingly positive, especially regarding goals for nitrogen management, seagrass recovery and habitat restoration. Citizens gave particularly high marks to the NEP for the writing and organization of the plan, which they say facilitated their review and understanding of the issues.

However, some residents were dissatisfied that the Tampa Bay NEP did not take a formal position against Florida Power & Light Company's request to burn a controversial Venezuelan fuel called Orimulsion at its Parrish plant in Manatee County. This would have added an additional 20 tons of nitrogen to the bay each year, unless steps to mitigate for those impacts had been required.

Despite a recommendation for approval from the state hearing officer and the FDEP, the Governor and Cabinet voted in April 1996 to deny the utility's request, citing unresolved public concerns about increased nitrogen oxide (or NOx) loadings to the bay, traffic impacts and the adequacy of spill response capabilities. The decision has been appealed. The Tampa Bay NEP provided depositions in the case emphasizing the need to cap nitrogen loadings at existing levels, based on preliminary water quality modeling analyses. Nitrogen loading goals for Tampa Bay were finalized and approved in June 1996.

An early outline of the five environmental action plans presented in *Charting the Course* was developed and presented for review in January 1995. Additional research and more than 200 responses from technical and citizen advisors were instrumental in shaping the draft bay management plan, released in January 1996 and now finalized for adoption.

Since the release of the draft plan, the Tampa Bay NEP has received hundreds of written comments from residents and agency and government partners. More than 250 citizens attended a series of four Town Meetings on Tampa Bay during February and March 1996 to discuss the bay restoration blueprint with panels of experts from their communities. The forums were co-sponsored by the League of Women Voters and rebroadcast extensively on local government and cable channels.

The NEP and its Community Advisory Committee also hosted a series of eight smaller focus groups to obtain feedback from specific interests, such as farmers, anglers, developers, the maritime community and residents. Community focus groups also played an important part in developing strategies advanced in the plan. These focus groups have helped to strengthen community investment in the bay plan and have assisted the NEP in understanding the concerns of key constituent groups.

A special 12-page newspaper supplement on *Charting the Course* distributed to more than 700,000 area residents through local newspapers in April of 1996 further enlisted interest and comments from the community. The news tab also was distributed through local libraries, bookstores, area attractions and government offices.

Planning for the Future

Local communities and agencies participating in the Tampa Bay NEP will sign an agreement in early 1997 accepting specific responsibilities for implementing the bay master plan. As attention shifts from planning to implementation, the focus of public involvement and education also will shift to address long-term but vitally important needs.

Future outreach to the community should seek to:

- foster continued community support for bay restoration and implementation of the CCMP by continuing to educate citizens on bay issues and publicize the bay's progress and needs;
- improve public faith in the ability of bay managers and organizations dedicated to its restoration and protection to "work smart" to leverage resources, avoid duplication and focus on priorities;
- maximize direct opportunities for public involvement in bay restoration and environmental improvement.

These objectives are part of an action plan on Public Education and Involvement (see Action Plans) developed in 1996 by the NEP and its Community Advisory Committee. The committee's recommendations will help guide the NEP as it oversees implementation of the bay masterplan.

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Early Action

Since its inception, the Tampa Bay National Estuary Program has secured almost \$1 million in matching grants and federal funds for early action projects designed to jump-start restoration efforts and build community support for the bay's recovery.

These diverse projects have allowed researchers to test new techniques and concepts for reducing pollution and restoring degraded habitats; identify and fill in gaps in current protection programs; and educate bay area citizens about threats facing the bay — and how they can help overcome them. Several of these key early action initiatives are summarized below:

Cockroach Bay Restoration

This secluded inlet on Tampa Bay's southeastern shore harbors some of the most productive mangrove forests and seagrass meadows in the entire bay system. However, the long-term health of this area has been jeopardized by intensive alteration of its upland fringe, primarily from agricultural and mining operations.

The Tampa Bay NEP, together with regional and state agencies providing matching funds, secured \$700,000 in federal grants to assist in the restoration of this area — \$300,000 from the Coastal America Program and \$400,000 in grants under Section 319(h) of the federal Clean Water Act. The effort is part of a \$2.6 million restoration directed by the Southwest Florida Water Management District's (SWFWMD) Surface Water Improvement & Management (SWIM) Program, in cooperation with Tampa Bay NEP and more than a dozen other public and private-sector partners. Hillsborough County spent \$2.1 million to purchase the restoration site, while SWFWMD-SWIM has dedicated or spent more than \$1.1 million to date for design, permitting and construction of the project's first phase.

The 500-acre project is the largest saltwater restoration of its kind conducted in Florida. The project is unique in its multi-faceted focus on creating a mosaic of habitats, including brackish and freshwater marshes, grass beds, oyster and live-bottom reefs, salt barrens, and upland pine and hardwood forests. In addition, the project will provide much-needed treatment of stormwater runoff from the surrounding farmlands by building a treatment pond in which runoff will be filtered before being discharged naturally to a restored stream bed leading to the bay.

Removal of exotic vegetation such as Brazilian pepper already has been partially completed, and the tidal stream restoration accomplished. Construction of further stormwater improvements began in 1996.

Bay Scallop Recovery

The bay scallop was once a common resident of Tampa Bay, but virtually disappeared in the mid-1960s. Many scientists blame declining water quality for the scallop's demise and speculate that the dramatic improvements now occurring in the bay's health may offer hope for restoring bay populations of these sensitive mollusks.

The Tampa Bay NEP has contributed more than \$130,000 to research aimed at pinpointing the water quality conditions necessary to support bay scallops and to aggressively restock suitable bay segments with scallops. That effort, directed by the University of South Florida, has so far raised more than a million juvenile scallops in laboratories, using strips of artificial turf that mimic the seagrasses to which the scallops cling in the wild. Hundreds of thousands of these juvenile scallops have been released in lower Tampa Bay, and monitoring is underway to determine whether these exploratory transplant efforts can help bring back a sustainable scallop population.

Gandy Shoreline Alternatives

Construction of vertical seawalls along the bay's borders has destroyed much of the bay's sloping fringe of ecologically valuable mangroves and salt marshes. This project, financed with \$65,000 from the Tampa Bay NEP, tested different techniques for "softening" seawalls along the industrialized southeast shoreline of the approach to the Gandy Bridge. Funds from the Tampa Bay NEP were matched with about \$150,000 from partners in the Bay Area Environmental Action Team (BAEAT), including SWIM, which implemented the project.

The project evaluated structurally sound and environmentally friendly alternatives to seawalls that enhance habitat values while still providing protection of upland properties. Methods evaluated included: lowering the elevation of the original seawall to create a gentler slope and installing riprap to allow tidal flushing and pools for juvenile fish; planting salt marsh grass behind the riprap to stabilize the shoreline; adding riprap to both ends of a remnant seawall offshore to provide habitat for oysters and crabs and to create a small lagoon behind the structure; and installing "MacBlox," cement blocks with scalloped contours and multiple openings that provide more surface areas for oysters, barnacles and fish to utilize.

Information gleaned from this project, which was completed in 1993, gave officials insight into how to design more ecologically benign shoreline stabilization structures. Techniques evaluated by the project are now being recommended by regulatory officials for commercial and residential use.

In addition to the seawall studies, the project also restored the littoral marsh and mangrove habitat upland of the seawall, constructed a boardwalk, and installed signs describing the restoration and the seawall alternatives demonstrated there.

Pepper Busters Brochure

Brazilian pepper is the most invasive and persistent of the exotic plants to gain a foothold along Tampa Bay. This tall shrub quickly moves into disturbed shoreline areas, strangling mangroves and forming a dense monoculture that provides little ecological benefit and is extremely difficult to eradicate.

The Tampa Bay NEP funded a \$3,000 project by the Cockroach Bay Aquatic Preserve Management Team (CAPMAT) and the South Hillsborough Pepper Patrol to create an illustrated brochure explaining the environmental hazards of this plant and how to get rid of it. It also explained the importance of preserving native plant communities. This popular brochure, one of the first of its kind written for the general public, is widely distributed by county and state environmental agencies, county extension agents and public libraries.

Assessment of Management Efforts to Protect Seagrass

Propeller scarring of seagrass beds in Tampa Bay is widespread and impairs the ability of these underwater meadows to protect against erosion and provide habitats for marine life. This project, financed in part with \$14,000 from the Tampa Bay NEP, enabled Pinellas County to assess the extent of seagrass scarring in a section of the bay through aerial mapping and interpretation and to evaluate various methods of protecting those seagrasses from further damage.

The site chosen for the project encompassed 420 acres of severely scarred seagrass around Fort DeSoto Park in Pinellas County, in a large embayment called Boca Ciega Bay. Scarred areas were mapped in March and October 1993, in October 1994 and again in December 1995. Mapping will continue annually for three more years.

After examining results of the baseline survey, two protection zones were established in the seagrass beds. A "caution zone" allows boats to enter under power as long as they don't damage seagrass beds. This directive is enforced by Sheriff's marine officers. A second "restricted zone" prohibits use of internal combustion engines within the area, although boaters may pole or drift in. The seagrass scarring was virtually the same for both the closed and restricted-access areas, indicating that signs alone may be effective deterrents to seagrass scarring and that complete closures may not be necessary to reduce propeller scarring.

This project is providing important information about what protective measures are effective in reducing seagrass scarring, and may help bay managers develop uniform, easily recognizable guidelines that can be implemented throughout not only the bay, but also the entire state.

Data-Sharing Through GIS

Tampa Bay is among the most well-studied waterways in the nation, yet valuable information from research and monitoring projects is not always shared among bay managers. This occurs often because the data bases and formats used by the agencies are incompatible with each other.

Maps are a particularly important and visible management tool, with their ability to relate a vast amount of information, including land uses, natural resources, drainage patterns, pollution sources and political boundaries. This project, supported with nearly \$20,000 from the Tampa Bay NEP, enabled the Environmental Protection Commission (EPC) of Hillsborough County to create a comprehensive, readily retrievable data base for the bay based on computer-generated maps utilizing Geographic Information System (GIS) technology.

Cockroach Bay was selected as a testing ground for this innovative approach. Officials with the EPC compiled information about Cockroach Bay from various sources and imported those files into their data banks. They then produced GIS maps that synthesized the information in a format compatible with other agencies, government organizations and research institutions. These techniques will be expanded bay-wide, providing across-the-board information that will result in less duplication and promote greater cooperation among bay managers in the future.

Seabird Rescue Initiative

Although Tampa Bay has largely been spared the damaging effects of major oil spills, those that have occurred have pointed to the need for a trained corps of volunteers to rescue and rehabilitate injured wildlife, especially seabirds.

In conjunction with the Pinellas Seabird Rehabilitation Center and the Tampa Bay Regional Planning Council, the Tampa Bay NEP contributed \$7,500 to finance the organization and training of nearly 100 citizen-volunteers to assist in seabird rescue efforts, in addition to the production of a volunteer training manual. Beginning in October 1991, the volunteers attended several seminars featuring leading wildlife rehabilitators; the group also received rescue kits, nets and communication equipment.

In August 1993, more than 330,000 gallons of oil and jet fuel were spilled in the bay when two barges and a tanker collided near the Sunshine Skyway Bridge. The seabird rescue teams put their training to good use, rescuing and treating 361 birds at a temporary "hospital" at Fort DeSoto Park. Eventually 310 birds, or 88 percent, were recovered and released — an extraordinary success rate when compared to similar efforts in other regions. The advance planning, organization and chain-of-command structure demonstrated by this network serves as a model for similar groups throughout the nation.

Emerson Point Project

Emerson Point is a historically and ecologically rich coastal area at the mouth of the Manatee River. The cultural resources of the 195-acre site include American Indian mounds and middens that were studied by researchers with the Smithsonian Institution, and the remains of a 19th century plantation. Natural resources include extensive hardwood hammocks, mangroves and saltmarshes, as well as colorful and rare live-bottom reefs in the shallow waters offshore.

The Tampa Bay NEP provided \$50,000 to Manatee County to aid in the protection and restoration of this area, which was purchased by the state in 1991 and is now managed by the County as Emerson Point Park. The project focuses on providing public access to the site for education and recreation, while preserving its unique cultural and natural attributes. Work includes removal of exotic vegetation, excavation and stabilization of the Indian mounds and plantation, and the construction of boardwalks and trails for public access. Signs will be posted to describe the land, its human and natural history and resident wildlife, and plans are now underway to develop a county environmental education center on the site to teach schoolchildren about this priceless ecological and historical heritage.

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NON-POINT SOURCE POLLUTION - refers to pollution that comes from many sources and cannot be traced to one specific point, such as pollution from stormwater runoff and the atmosphere.

OLIGOHALINE - refers to water with a very low salinity (salt content), ranging from 0.5 to 10 parts per thousand (ppt). Fresh water is characterized by salinity of less than 0.5 ppt; sea water contains about 35 ppt.

PHYTOPLANKTON - free-floating aquatic plants and plant-like organisms, usually algae; an important food source for many animals.

POINT-SOURCE POLLUTION - refers to pollution that comes from a specific source or point of origin, such as a discharge pipe or outfall.

RUNOFF - water from rain or irrigation that flows over land. Runoff often carries pollutants such as oils, fertilizers and pesticides and is frequently a major component of non-point-source pollution.

SALT MARSH - a marsh growing in the intertidal and upper coastal zone, where salt water from the sea has a strong influence on the types of plant life. Salt marshes are important wetland habitats for many kinds of fish and wildlife.

SEAGRASSES - true flowering plants (not grasses) that grow underwater in shallow bays and estuaries. Seagrass meadows provide food and refuge for many marine animals.

SHELLFISH - a generic term that includes both crustaceans and mollusks, especially those used for food. The term finfish, by contrast, refers to true fishes.

SPOIL - sediments removed during dredging. Spoil may be deposited underwater or on islands created specifically for spoil disposal.

TOXIC - poisonous or directly harmful.

TURBIDITY - cloudiness of water from suspended material or particles. As the cloudiness increases, so does the turbidity; low turbidity indicates clear water and may be associated with good water quality.

WASTEWATER TREATMENT - processes that help remove solids, nutrients and other pollutants from water before it is discharged or reused.

WATER COLUMN - an inclusive term, covering the area that extends from the bottom sediments to the surface for the water in a lake, estuary or ocean.

WATERSHED - the geographic region that drains into a particular stream, river or body of water. The Tampa Bay watershed covers more than 2,200 square miles in six counties.

WETLAND - land where the water table is usually at or near the surface. Some wetlands contain water year-round; others may remain relatively dry for months, becoming moist only during periods of heavy rain. Wetlands are vital habitats for many species of plants and animals; they are protected by local, state and federal regulations.

ZOOPLANKTON - free-floating aquatic animals ranging in size from microscopic, single-celled organisms to large jellyfish. Zooplankton are an important source of food for many types of fish and animals.

ACRONYMS

ACP	AREA CONTINGENCY PLAN
AWT	ADVANCED WASTEWATER TREATMENT
BEMR	BIENNIAL ENVIRONMENTAL MONITORING REPORT
BMP	BEST MANAGEMENT PRACTICE
CARL	CONSERVATION AND RECREATION LANDS
CCMP	COMPREHENSIVE CONSERVATION & MANAGEMENT PLAN
CFMP	CRITICAL FISHERIES MONITORING PROGRAM
CIP	CAPITAL IMPROVEMENT PROGRAM
DDT	DICHLORODIPHENYL-TRICHLOROETHYLENE
DGPS	DIFFERENTIAL GLOBAL POSITIONING SYSTEM
DHRS	(Florida) DEPT. OF HEALTH AND REHABILITATIVE SERVICES
ELM	ENVIRONMENTAL LANDSCAPE MAINTENANCE
EPA	ENVIRONMENTAL PROTECTION AGENCY
EPC	ENVIRONMENTAL PROTECTION COMMISSION (HILLSBOROUGH COUNTY)
ERP	ENVIRONMENTAL RESOURCE PERMIT
FAC	FLORIDA ADMINISTRATIVE CODE
FADS	FLORIDA ATMOSPHERIC DEPOSITION SYSTEM
FCES	FLORIDA COOPERATIVE EXTENSION SERVICE
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
FERC	FEDERAL ENERGY REGULATORY COMMISSION
FGFWFC	FLORIDA GAME AND FRESH WATER FISH COMMISSION
FMRI	FLORIDA MARINE RESEARCH INSTITUTE
FPC	FLORIDA POWER CORPORATION
FPL	FLORIDA POWER & LIGHT
FWPCA	FEDERAL WATER POLLUTION CONTROL ACT
FY	FISCAL YEAR
FY&N	FLORIDA YARDS AND NEIGHBORHOODS
GPS	GLOBAL POSITIONING SYSTEM
IMC	IMC-AGRICO
LTMS	LONG-TERM MANAGEMENT STRATEGY
MGD	MILLION GALLONS PER DAY
MSSW	MANAGEMENT AND STORAGE OF SURFACE WATERS
NOAA	NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
NOEL	NO OBSERVABLE EFFECTS LEVEL
NOx	NITROGEN OXIDES
NPDES	NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
NPL	NATIONAL PRIORITIES LIST
O & M	OPERATING AND MAINTENANCE (BUDGET)
OSDS	ON-SITE DISPOSAL SYSTEMS
PAH	POLYNUCLEAR AROMATIC HYDROCARBONS
PCB	POLYCHLORINATED BIPHENYLS
PEL	PROBABLE EFFECTS LEVEL
PORTS	PHYSICAL OCEANOGRAPHIC REAL-TIME SYSTEM
PRTF	POLLUTION RECOVERY TRUST FUND
RCRA	RESOURCE CONSERVATION & RECOVERY ACT
SWFWMD	SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
SWIM	SURFACE WATER IMPROVEMENT AND MANAGEMENT PROGRAM (SWFWMD)
TBNEP	TAMPA BAY NATIONAL ESTUARY PROGRAM
TBRPC	TAMPA BAY REGIONAL PLANNING COUNCIL
TECO	TAMPA ELECTRIC COMPANY
TKN	TOTAL KELDAHL NITROGEN
TN	TOTAL NITROGEN
TPA	TAMPA PORT AUTHORITY
TSS	TOTAL SUSPENDED SOLIDS
USACOE	UNITED STATES ARMY CORPS OF ENGINEERS
USDOT	UNITED STATES DEPARTMENT OF TRANSPORTATION
USEPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
USF	UNIVERSITY OF SOUTH FLORIDA
UST	UNDERGROUND STORAGE TANKS
VTS	VESSEL TRACKING SYSTEM
WAFR	WASTEWATER FACILITY REGULATION DATABASE
WCRWSA	WEST COAST REGIONAL WATER SUPPLY AUTHORITY
WWTP	WASTEWATER TREATMENT PLANT

CHARTING THE COURSE CAPS FIVE YEARS OF SCIENTIFIC RESEARCH AND COMMUNITY OUTREACH BY THE TAMPA BAY NATIONAL ESTUARY PROGRAM (NEP), WHICH WAS ESTABLISHED IN 1991 TO ASSIST THE REGION IN DEVELOPING A COMPREHENSIVE PLAN FOR BAY RESTORATION AND PROTECTION.

ACTION PLANS FOR BAY IMPROVEMENT HAVE BEEN DEVELOPED WITH ASSISTANCE FROM BAY EXPERTS, ADVOCATES, COMMUNITY INTERESTS AND CITIZENS. RESIDENTS ATTENDED A SERIES OF TOWN MEETINGS ON TAMPA BAY IN THE SPRING OF 1996 TO DISCUSS THE DRAFT PLAN WITH PANELS OF EXPERTS FROM THEIR COMMUNITIES. THE NEP AND ITS CITIZEN ADVISORS ALSO CONDUCTED A SERIES OF SMALLER FOCUS GROUPS TO SOLICIT FEEDBACK FROM SPECIFIC INTEREST GROUPS.

THIS STRATEGIC BLUEPRINT REFLECTS BROAD-BASED INPUT FROM INDIVIDUALS, GROUPS AND COMMUNITIES THAT SHARE A COMMON INTEREST IN A HEALTHY BAY AS A CORNERSTONE OF A HEALTHY AND PROSPEROUS REGION.

CHARTING THE COURSE WAS PRODUCED BY THE TAMPA BAY NATIONAL ESTUARY PROGRAM, IN COOPERATION WITH THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND LOCAL GOVERNMENT AND AGENCY PARTNERS.



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